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# Highway Safety Literature

U.S. Department of Transportation National Highway Traffic Safety Administration

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**NTIS:** National Technical Information Service, Springfield, Va. 22161. Order by title and accession number: PB, AD, or HS.

When no PB number is given for NHTSA Technical Reports, order by prefacing the HS number with DOT, i.e. DOT-HS-000 000.

**GPO:** Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and catalog or stock number.

**Reference copy only:** Documents may be examined at the NHTSA Technical Reference Branch or borrowed on inter-library loan through your local library.

**See publication:** Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

**SAE:** Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and SAE report number.

**TRB:** Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

**Corporate author:** Inquiries should be addressed to the organization listed in the individual citation.

## **ABSTRACT CITATIONS**

# SAMPLE ENTRIES

## FORMAT OF ENTRIES IN HIGHWAY SAFETY LITERATURE

NHTSA accession number ----- HS-013 124  
Title of document ----- **MAXIMUM BRAKE PEDAL FORCES PRODUCED BY  
MALE AND FEMALE DRIVERS**  
Abstract ----- The object of this research was to obtain data concerning the maximum amount of brake pedal force that automobile drivers were able to sustain over a period of ten seconds. Subjects were told to apply the brakes in the test car as they would in a panic stop, and to exert as much force as possible on the pedal over the entire ten second test period. A total of 84 subjects were tested, including 42 males and 42 females. The results indicated that there is a wide distribution of values which characterizes the pedal force that the subjects were able to generate. Male subjects produced generally higher forces than did females. Over half the women tested were unable to exert more than 150 lbs. of force with either foot alone, but when both feet were applied to the pedal, force levels rose significantly.  
Personal author(s) ----- by C. R. VonBuseck  
Corporate author (or author's affiliation) ----- General Motors Corp.  
Publication date; pagination ----- 1973? ; 18p  
Supplementary note ----- Excerpts from Maximum Parking Brake Forces Applied by Male and Female Drivers (EM-23) BY R. L. Bierley, 1965, are included.  
Availability ----- Availability: Corporate author

NHTSA accession number ----- HS-018 924  
Title of document ----- **NATURAL FREQUENCIES OF THE BIAS TIRE**  
Abstract ----- The lowest natural frequencies of a bias tire under inflation pressure are deduced by assuming the bias tire as a composite structure of a bias-laminated, toroidal membrane shell and rigorously taking three displacement components into consideration. The point collocation method is used to solve a derived system of differential equations with variable coefficients. It is found that the lowest natural frequencies calculated for two kinds of bias tire agree well with the corresponding experimental results in a wide range of inflation pressures. Results of the approximate analysis show that the influences of the in-plane inertia forces on natural frequency may be considered small, but the influences of in-plane displacements are large, particularly on the natural frequency of the tire under low inflation pressure.  
Personal author(s) ----- by Masami Hirano; Takashi Akasaka  
Journal citation ----- Publ: Tire Science and Technology v4 n2 p86-114 (May 1976)  
Publication date ----- 1976; 6refs  
Availability ----- Availability: See publication



HS-025 288

## **RISKS OF ROAD TRANSPORTATION IN A PSYCHOLOGICAL PERSPECTIVE**

A review is presented of the literature and psychological facts which may explain why the individual driver and modern society seem willing to accept higher risks in road transportation than in most other activities. Risky driving behavior may depend on a driver's overestimation of his driving skill in a particular situation, his conscious decision to drive under high risk, or his failure to perceive risk in a particular situation. Among the different means used in order to effect a change in these factors are training programs, the dissemination of information to change attitudes toward traffic risks, and environmental design changes to reduce risk. Empirical research indicates that greater risks are accepted if some kind of control is experienced in a situation; this is especially applicable to driving. Although objective and subjective estimates of the risk inherent in different traffic elements seem to coincide fairly well with a road's physical characteristics, objective risks are underestimated in relation to speed, black spots, night driving, and narrow roads. The importance of these factors, and of alcohol intoxication and imitative behavior for risk taking, is discussed, as are comparisons of the estimated risks of different transportation systems and other risk sources. Responsibility for an accident is a very important element in risk acceptance. If the responsibility can be attributed to individual risk takers, as in car driving, society is willing to accept higher risk levels. The prevailing within-system perspective on risks in road transportation is contrasted with the more important and difficult global perspective which puts the risks of the road transportation system in a societal context.

by Ola Svenson

Publ: Accident Analysis and Prevention v10 n4 p267-80 (Dec 1978)

1978; 67refs

Sponsored by Com. for Future Oriented Res., and Swedish Council for Social Science Res.

Availability: See publication

HS-025 289

## **ACCIDENT PROBABILITIES AND SEAT BELT USAGE: A PSYCHOLOGICAL PERSPECTIVE**

Motorists' reluctance to wear seat belts is examined in light of research showing that protective behavior is influenced more by the probability of a hazard than by the magnitude of its consequences, and that people are not inclined to protect themselves voluntarily against very low probability threats. It is argued that the probability of death or injury on any single automobile trip may be too low to incite a motorist's concern. Maintenance of a "single trip" perspective makes it unlikely that seat belts will be used. Change of perspective towards consideration of the risks faced during a lifetime of driving, may increase the perceived probabilities of injury and death and therefore induce more people to wear seat belts.

by P. Slovic; B. Fischhoff; S. Lichtenstein  
Perceptronics, Inc., Decision Res., 1201 Oak St., Eugene, Oreg.

NSF-ENV77-15332

Publ: Accident Analysis and Prevention v10 n4 p281-5 (Dec 1978)

1978; 26refs

Availability: See publication

HS-025 290

## **BLOOD TEST LEGISLATION IN NEW ZEALAND [ALCOHOL LEVELS IN DRIVERS]**

The 1969 compulsory blood test law, which also established an absolute blood alcohol limit of 100 mg/100 ml for New Zealand drivers, is evaluated in terms of reported incidence of alcohol in road crashes and according to various surrogate measurements involving road crashes. These measurements include before and after studies of total fatal crashes, total nonfatal injury crashes, fatal crashes during nighttime, nonfatal injury crashes during nighttime, weekend night injury crashes, and single vs. multivehicle crashes. Before and after comparisons with Great Britain and Canada were made regarding total road deaths, total injuries from road crashes, and percentage killed and injured during main drinking hours (U.K. comparison only). The 1974 amendment, which liberalized the criterion for "due cause to suspect" alcohol consumption by requiring only "suspicion", is evaluated in terms of enforcement activity. It is concluded that the 1969 law did not have the kind of immediate effect that was achieved in Great Britain in 1967. There may have been a more gradual effect in New Zealand, but it cannot be certain. The difference in impact was almost certainly due to attendant circumstances and the quite different types of publicity given the alcohol campaigns in the two countries. It was clearly not attributable to differences in the statute's content or in its enforcement, which has always been relatively active and has increased over the years. The increase in enforcement activity seems to have been accelerated by the 1974 amendment. There was a marked increase in the number of blood tests, more pronounced in the lower range of blood alcohol concentration.

by Paul M. Hurst

Publ: Accident Analysis and Prevention v10 n4 p287-96 (Dec 1978)

1978; 15refs

Availability: See publication

HS-025 291

## **THE PREDICTIVE POWER OF DRIVER DEMERIT POINTS: A CASE STUDY OF MALE DRIVERS IN NOVA SCOTIA**

The predictive power of driver demerit points and other routinely-collected driver history data was analyzed using prestratified samples of younger and older male drivers in Nova Scotia who had similar driver demerit point histories in 1971 and 1972. Analysis of points accumulated by these drivers in 1973 and 1974 revealed positive and statistically-significant associations between past and future demerit point accumulations for both age groups, with stronger positive associations among younger drivers. Other variables such as type of traffic violation, size of community in which driver lived, and property damage associated with violations also exhibited predictive power in the multivariate regression models tested. Restrictions are discussed on use of these predictive models in accident prevention programs, because of relatively low coefficients of correlation. It is noted that a traffic violation conviction for an individual driver, even one with a recent

history of violations, is typically a rare event when measured in terms of months or years between convictions.

by M. G. Brown; H. J. Thiebaut  
 Publ: Accident Analysis and Prevention v10 n4 p297-312 (Dec 1978)  
 1978; 5refs  
 Sponsored in part by Dennis Medical Fund.  
 Availability: See publication

## HS-025 292

**BRAKES: FORGOTTEN BUT APPRECIATED**

Major design changes in automobile brakes in the past decade are discussed, as are basic functions of a braking system and future trends in car brakes. Three major design changes in braking in the past ten years, excluding antilock systems which are still to become a true production item, are disc brakes, self-adjusting brakes, and divided hydraulic circuits. Almost all volume production cars now have disc brakes on the front wheels at the very least; a similar proportion of cars have a self-adjusting brake system; all cars sold in the European Economic Community, the U.S., Japan, Norway, Sweden, Switzerland, and Australia have to have divided hydraulic circuits, and systems that are wholly approved by relevant authorities. The basic capabilities of a brake system include the following: ability to stop the car; ability to stop it stably; ability to dissipate the energy of the car during stopping as heat, without causing an excessive temperature rise or fade, a pedal effort which at all times is acceptable, and an effective parking brake. Future trends in brakes include use of aluminum (e.g. in calipers) and plastic parts (e.g. in master cylinders and servos) to reduce weight, and longer life. There is considerable interest in producing brakes that will continue for 24,000 mi without any servicing, in including pad/lining replacement, and in inclusion of brake linings as a warranty item. Diagrams and photographs of brake valves and calipers are included, as well as a diagram of a handbrake mechanism.

by Rex Greenslade  
 Publ: Motor v155 n3981 p29-32 (27 Jan 1979)  
 1979; 3refs  
 At head of title: Technicalities Untangled.  
 Availability: See publication

## HS-025 625

**SELF-ADAPTIVE ANTI-SKID BRAKING SYSTEM**

The history, design features, system components, operation, rotational accelerometer unit, and experimental results are described for a prototype antiskid braking system by PCB Controls Ltd., Dublin, Ireland, which is truly adaptive to changing tire/road conditions. The system continuously monitors road surface friction and adjusts braking pressure accordingly, using a new method of measuring wheel acceleration. The system is independent of tire and brake wear and requires no adjustment after initial calibration. The deceleration of the wheel during braking is detected by a rotational accelerometer sensor and compared with both minimum and maximum reference values of deceleration in a hysteretic unit. This unit is an electronic package designed so that the minimum reference level is fixed, but the maximum reference level is variable and dependent upon the maximum frictional force between wheel and road surface. The deceleration signal from the wheel controls a pneumatic reservoir brake pressure, independent of driver braking action, so that pressure is

released from the wheel if its actual deceleration exceeds the maximum reference value, and pressure is fully reapplied to the wheel if its actual deceleration decreases below the minimum reference level. The system not only adjusts braking effort precisely according to the degree of road slipperiness indicated in each previous cycle, but it also shapes each braking pulse in a manner which approaches the point of maximum friction rather than blindly traversing it. This continual learning capability of the system results in a pulsing sequence which varies widely from 5 Hz to virtually 0 Hz, the latter occurring when the system is ideally tuned momentarily to surface conditions. The present prototype rig is electro-pneumatic, but the same principles can readily be incorporated into electrohydraulic or electromagnetic systems.

by Desmond F. Moore; Peter Byrne  
 Publ: Automotive Engineer v4 n1 p50-2 (Feb-Mar 1979)  
 1979; 4refs  
 Sponsored by Industrial Devel. Authority, and National Science Council (Ireland).  
 Availability: See publication

## HS-025 626

**DIESEL VEHICLE NOISE CONTROL**

An account of the Transport and Road Res. Lab. (TRRL), England, Quiet Heavy Vehicle (QHV) project is followed by details of recent developments in diesel engine noise control at the Inst. of Sound and Vibration Res. (ISVR), Southampton Univ. (England), and of noise research on production engines at Perkins (U.K.). Although the 238 kW (320 bhp) Rolls-Royce-engined, 38-ton Foden S83 tractor (QHV) was demonstrated in Nov 1978 at TRRL to have a drive-by noise level of 81 dB(A), a full report on the vehicle will not be available for six months. The Foden QHV meets much more closely than the Leyland Buffalo QHV (demonstrated by TRRL several years ago) the objective that all essential features of the vehicles were to be suitable for incorporation in practicable production vehicles. The only obvious difficulty seems to be that of exceeding the 15-m overall vehicle length limit by 0.4 m due to the space required by the cooling system. The general design philosophy was to reduce sound emission from the engine by means of structural changes and to provide a structural enclosure around the engine and transmission, to isolate airborne noise transmitted from the engine structure and its ancillaries, to use a totally-ducted cooling system which employs a mixed-flow fan, and to redesign the exhaust system. Major development of the QHV engine, a specially-adapted Rolls-Royce Eagle engine, was carried out by ISVR. Tire noise was examined independently by TRRL. Work by Foden resulted in reduced in-cab noise levels of the QHV. Under conditions of maximum acceleration, the maximum noise level in the vicinity of the driver's ear is 77.5 dB(A). In 1967, Perkins began its noise reduction program in three main sections: reducing noise level without major design change, assisting customers with noise reduction on complete vehicles, and designing new engines. In an ongoing engine research project, overall engine noise has been reduced to date by 7 dB(A); another project has led to a reduction of up to 12 dB(A) in a conventional cooling fan.

Publ: Automotive Engineer v4 n1 p23-7 (Feb-Mar 1979)  
 1979; 6refs  
 Availability: See publication

October 31, 1979

HS-025 630

HS-025 627

### **PROJECT CHILDSAFE COULD SAVE YOUR CHILD'S LIFE [CHILD RESTRAINTS]**

Project Childsafe, a safety/health education program originally sponsored by the Wisconsin Hosp. Assoc., and its auxiliaries, in cooperation with the Wisconsin Dept. of Public Instruction, is alerting parents to the hazards children face when traveling unrestrained in automobiles. The project is also providing information on proper safety devices and other traveling aids. Initially designed to be given in hospitals to new parents, Project Childsafe has been expanded and adapted for use in other situations (e.g. company safety meetings). Project Childsafe is a short (about 10 min) slide/sound show, with a kit including brochures to be given to observers. The materials are based on information collected by Physicians for Automotive Safety and Action for Child Transportation, its citizen affiliate. Project Childsafe explains the need for effective, crash-tested restraints that distribute forces of impact over a wide area of the child's body in case of an accident. The car's safety belt holds the restraint in place. Infants up to 9 mo or 20 lb should face backward; after that, they should face forward. Once the child reaches age 4 and weighs at least 40 lb, he is probably ready to use an adult safety belt, but he should be 55 in tall before using a shoulder strap. Groups presently reinforcing the Childsafe message include local safety councils, public health nurses, local pediatricians, local law enforcement personnel, university extension homemakers clubs, car dealers, infant specialty stores, and civic clubs. In addition to providing information about effective crash protection, Project Childsafe stresses the regular use of car restraints. It is noted that the project has increased seat belt usage by parents.

by Craig Fischer  
Publ: National Safety News v119 n4 p56-7 (Feb 1979)  
1979

At head of title: Off the Job. Adapted from a presentation by C. Ernest Cooney, Wisconsin Dept. of Public Instruction, and Susan Kummerow, Wisconsin Hosp. Assoc.  
Availability: See publication

HS-025 628

### **MOTORCYCLE SAFETY, TRANSPORT AND TRAFFIC CONTROL. OVERSEAS VISIT REPORT: JAPAN (AUGUST 1977)**

Discussions are reported which were held with the two major motorcycle manufacturers of the Japan Automotive Manufacturers Assoc., Honda Motor Co., and Yamaha Motor Co., concerning their motorcycle safety activities. An account is given of meetings with various road transport authorities and area traffic control units in Japan to obtain background information on the country's highway/traffic operations. These discussions were held as part of a two-week visit to Japan in Aug 1977 to attend the 7th International Symposium on Transport and Traffic Flow which was held in Kyoto. Appended are a comprehensive list of documentation obtained during these meetings (reference to files in Australian Road Res. Board Registry), a list of pertinent color slides taken during visit; names and addresses of individuals consulted on trip; names and addresses of foreign participants in Symposium; itinerary of Japan visit; a summary of Japanese driving license types, driving license examinations, and driving school facilities and organization; and Japanese emission and noise control standards. As a result of information gathered during the visit, it is recommended that a comprehensive view of motorcycle users

be compiled, that training for motorcyclists be specifically directed at avoidance abilities and that skills assessment be quantized, and that testing procedures be developed for wet weather braking performance of disc brakes.

by M. R. Wigan  
Australian Road Res. Board, Box 156 (Bag 4), Nunawading, Vic., 3131, Australia  
Rept. No. ARRB-ARR-78; ARRMS 77/183; 1977; 74p refs  
Availability: Corporate author

HS-025 629

### **CHARACTERISTICS OF THE MOTORCYCLE POPULATION IN USE IN AUSTRALIA, AND THE RATE OF EFFECT OF DESIGN CHANGE**

In an initial study, available data on motorcycle life expectancy in Australia are analyzed in an effort to determine the rate at which design changes introduced for safety or other reasons (Australian Design Rules) will spread through the in-use motorcycle population. It is suggested that if design modifications are to be promulgated for safety reasons, they should be introduced if possible before the end of 1978, in order to have the most effective impact on traffic safety. The scrapping and new registration rates of motorcycles and cars are compared. The average life expectancy of motorcycles in Australia is 6 years vs. 13 years for cars (5% of the motorcycle population drops out of the registration figures in 1 year vs. 5 years for 5% of the car population). Socioeconomic and demographic factors, not considered in the present study, should be given specific attention in the future. Present data on the characteristics of the motorcycle population are restricted to the publicly-available Australian Bureau of Statistics data derived from Motor Registry records. Improvements in the data would include disaggregation of the motorcycle market into types of machines (i.e. agricultural, trail, street, dual-purpose (street/trail), competition), information on the machine itself (power rating, engine type, gross weight, etc.); and inclusion of nonregistered motorcycles. It is recommended that safety improvements be encouraged in motorcycle design rather than stressing regulation of use.

by M. R. Wigan; T. Thoresen  
Australian Road Res. Board, Box 156 (Bag 4), Nunawading, Vic., 3131, Australia  
Rept. No. ARRB-AIR-812-1; 1977; 23p 13refs  
See also HS-025 633.  
Availability: Corporate author

HS-025 630

### **MOTORCYCLE HELMETS AND VISORS: A BRIEF REVIEW FOLLOWING A FEDERAL INQUIRY**

The introduction of a new Australian Standard for motorcycle helmets (AS 1698-1974) in 1975 has been followed by legislative action. Evidence given before the House of Representatives Standing Com. on Road Safety has indicated a number of possible or potential problems. A summary is presented of material pertinent to the Standards Assoc. of Australia Committees AU/12 (Vehicle Users Helmets), AU/13 (Automotive Eye Protection), and CS/14 (General Purpose Helmets) as raised by the Standing Com. on Road Safety in its Report on Motorcycle and Bicycle Safety (HOR 1978), and of recommendations of the Standing Com. which cover motorcycle helmets (AS 1698-1974), motorcycle helmet visors (AS 1609-1974), and

bicycle helmets (now covered by AS 2063-1977). Extracts from a report by the author (1978) relating to consultations with foreign researchers (U.K., U.S.) studying helmet performance are also presented. The evidence and recommendations presented suggest that the definitions and scope of AS 2063-1977 and AS 1698-1974 require careful consideration and combination of use to ensure effective standards coverage for on- and off-road helmet users for all types of single-track vehicles. It is suggested that many of the needs or desires of interested parties could well be met by the drafting of a further helmet standard with more stringent impact-attenuation requirements. It is also suggested that AS 1609 be reviewed with the aim of including quality assurance standards for tinted visors.

by M. R. Wigan  
Australian Road Res. Board, Box 156 (Bag 4), Nunawading,  
Vic., 3131, Australia  
Rept. No. ARRB-AIR-812-2; 1978; 44p 35refs  
Availability: Corporate author

HS-025 631

# **MOTORCYCLE SAFETY. A REVIEW OF INFORMATION GATHERED FROM OVERSEAS: JANUARY, 1978 [UNITED STATES AND UNITED KINGDOM]**

Information gathered at various meetings with researchers in motorcycle safety in the U.K. and U.S. in Jan 1978 is collated, incorporating material subsequently collected by or sent to the author. In the U.K., consultations were made with government representatives (Transport and Road Res. Lab., Dept. of Transport), and the Inst. of Motorcycling, and contact was made with representatives from the motorcycle industry (manufacturers of motorcycles, helmets and visors, and motorcycle tires). Motorcycle products were viewed in displays at the January Motorcycle Show at the Royal Horticultural Halls. In the U.S., visits were made to the National Hwy. Traffic Safety Administration, Insurance Inst. for Hwy. Safety, Motorcycle Industry Council, Motorcycle Safety Foundation, Systems Technology International (Los Angeles), California Dept. of Motor Vehicles, Univ. of Southern California's Inst. of Safety and Systems Management, and the Bell Helmet Co. (Norwalk, Calif.). The 57th Annual Meeting of the Transportation Res. Board (TRB) was attended (including a meeting of Moped Subcom. of TRB Bicycle Com., discussion with representatives from Hwy. Safety Res. Center at the Univ. of North Carolina, and a presentation on motorcycle daytime visibility aids). This compilation of motorcycle safety information covers the subjects of motorcycle dynamics, wet weather and antilock braking, accident analysis, education, training, licensing, legislation, motorcycle visibility, helmet performance, helmet and visor standards, U.S. motorcycle and moped legislation, and moped issues.

by M. R. Wigan  
Australian Road Res. Board, Box 156 (Bag 4), Nunawading,  
Vic., 3131, Australia  
Rept. No. ARRB-AIR-812-3; 1978; 91p refs  
Availability: Corporate author

HS-025 632

# **MOTORCYCLE DISC BRAKE PERFORMANCE: A REVIEW OF AMELIATORY MEASURES AND TEST PROCEDURES**

An up-to-date review of wet-weather braking problems of motorcycles and the associated test procedures is presented, complemented by a review of the Transport and Road Res. Lab. (U.K.) Seminar on Wet Braking held on 19 Sep 1978, with emphasis on the reported effectiveness of sintered-metal brake pads. Problems of motorcycle disc brakes in wet weather relate to reduced power of the brake and considerable delays (of up to 3 sec to 4 sec) before any braking action starts. U.S. (Federal Motor Vehicle Safety Standard 122) and Australian (Australian Design Rule (ADR) 33) regulations are inadequate for testing motorcycle disc brakes for wet-weather performance. The National Hwy. Traffic Safety Administration's Office of Defects Investigation of Honda GL 1000 and CB 750F models which led to the adoption of grooved pads for motorcycle brakes is cited. It is stated that adoption of suitable standards for wet-weather braking will bring forward the need for both a reliable antilock brake and improved technical capability of the braking system to make best use of it. Recommendations include: revision of ADR 33 for wet braking test procedures; encouragement of Australian brake friction-material manufacturers to develop suitable replacement sintered-metal pad materials, and encouragement to service the existing Australian motorcycle fleet with sintered-metal pad replacements; initiation of research on rider braking behavior patterns as a basis for improved training, and more appropriate and effective vehicle braking standards for motorcycles; and initiation of review and research on the effect of antilock braking systems on rider behavior, rider training, and vehicle braking standard drafting and revision.

by M. R. Wigan  
Australian Road Res. Board, Box 156 (Bag 4), Nunawading,  
Vic., 3131, Australia  
Rept. No. ARRB-AIR-812-4; 1978; 47p refs  
Availability: Corporate author

HS-025 633

# **THE AGE DISTRIBUTION AND LIFE OF MOTORCYCLES IN AUSTRALIA AND THE IMPLICATIONS FOR DESIGN RULES**

This analysis updates and expands on earlier work which considered one aspect of the motorcycle accident countermeasure problem in Australia, namely, the rate at which design changes introduced for road safety and other reasons (Australian Design Rules) spread through the population of motorcycles registered for road use. An analysis of available data on life expectancy of motorcycles in Australia strongly suggests that if design modifications to new motorcycles are to be promulgated for safety reasons, significant penetration of the motorcycle population would follow from their early introduction. Despite declining new registrations of motorcycles in Australia, the short registered life of motorcycles suggests that design rules, draft regulations, and normal competitive marketing safety innovations applying to new vehicles can substantially affect the characteristics of the registered motorcycle population in a relatively short period of time. Socioeconomic and demographic factors were not considered in the present study in any detail but should be given specific attention in the future. Present data on the motorcycle population in Australia

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are restricted to Australian Bureau of Statistics data derived from Motor Registry records. Improvements would include disaggregation of the motorcycle markets into types of machines (i.e. agricultural, trail, street, dual-purpose (street/trail), competition), better data on the machine itself (e.g. power rating, engine type, gross weight), and inclusion of nonregistered motorcycles in statistics.

by M. R. Wigan; T. Thoresen  
Australian Road Res. Board, Box 156 (Bag 4), Nunawading,  
Vic., 3131, Australia  
1979?; 11p 15refs  
Galley proofs of an article to appear in Australian Road  
Research v9 n1 (Mar 1979). See also HS-025 629.  
Availability: Corporate author

HS-025 635

### **DRIVERS LICENSE GUIDE 1979**

For the purpose of detecting altered and fraudulent driver's licenses, all necessary information on license format, colors, and markings are provided for the individual states and provinces of the U.S. and Canada. License formats cover all but the special licenses issued for restricted, minor, special-vehicle, or other use. All valid formats are included not just current issue. Color photographs of sample driver's licenses accompany information on formats (description, minor's license, validation, license number, operator's license term, operator's minimum age, ownership proof in car, registration expiration date). The following license information is also provided: state and province policies covering operation of motorcycles, state procedures for military personnel license extensions, identification card policies of state motor vehicle departments, description of Remington Rand SOUNDEX system for assigning license numbers, color photographs of major bank credit cards, and addresses and phone numbers for law enforcement purposes, color photographs of current (valid during some part of 1979) automobile registration plates in U.S. and Canada, and a table showing the state of issuance for social security numbers.

Drivers License Guide Co., 1492 Oddstad Dr., Redwood City,  
Calif. 94063  
1979; 96p  
Availability: Corporate author

HS-025 636

### **SAFETY FIRST [IN AUTOMOBILES]**

Safety information is provided for the British motorist. Seat belts are pointed out as probably the best and cheapest forms of injury prevention in automobiles. Standard and automatic seat belt systems for adults and child safety seats are described and regulations regarding restraint system installation and use in the U.K. are cited. Legal requirements for the operating condition of seat belt systems are outlined. The use of separate, red, rear fog lamps, as stipulated by the law, is explained. The transport of spare gasoline in cans approved by the law ("iron" container, painted red, and marked "Petroleum Spirit--Highly Inflammable") is mentioned; several recommended brand names of gasoline containers are mentioned. Procedures are outlined for the safe use of jump cables for starting a dead battery. Characteristics of good tow ropes and the proper use of tow ropes are described. Advice is given on what to do in case of a shattered windshield; two brand names of temporary (plastic) windshields are mentioned. Ways to

help avoid fires caused by electrical faults (protect high-risk areas by grommets, check for carburetor leaks) are considered, and a plumbed in fire extinguisher system for automobiles is described.

by Martin Lewis  
Publ: Autocar v150 n4292 p32-4 (10 Feb 1979)  
1979; 1ref  
Availability: See publication

HS-025 637

### **COMPUTERIZED TRAFFIC CONTROL SAVES TIME AND FUEL**

Computer-controlled traffic systems, operating at various levels of sophistication, are now in use in some 200 cities in the U.S. Information on traffic conditions around a city flows continuously into a computer, which continuously calculates where the heaviest traffic is accumulating and how to turn traffic lights on and off to move the greatest number of people in the shortest possible time. By keeping traffic moving, these systems help save fuel, reduce travel time, and cut pollution and accidents. In principle, a computerized traffic control system consists of a computer and sensors throughout a city which detect the movement and concentration of cars. The computer, which is connected to and is in control of all traffic lights in a city, figures when each light should be on red and green, and for how long. Traffic can also be monitored by TV and manual control of signal lights applied to solve a congestion problem. Engineers are working to develop new hardware to make such equipment even more effective. Microprocessors are being developed to fine-tune the flow of traffic and reduce the amount of information that has to flow back to the central processor. Laser-communications links are solving the information-transmission problem. Developments are also being made in traffic-control computer programs, of which there are three generations. First-generation software uses prestored timing patterns for each signal cycle based on previously-collected traffic data. Second-generation software, instead of selecting a prestored timing pattern based on traffic flow, creates a new traffic pattern every time the flow changes. Third-generation programs enhance the control sensitivity by developing individual timing patterns for each intersection. Third-generation software is still being studied, but a second-generation program has been developed for testing. One problem with current traffic control systems is the high telephone utility cost.

by Mort LaBrecque  
Publ: Popular Science v214 n3 p56, 59-60, 62 (Mar 1979)  
1979; 1ref  
Availability: See publication

HS-025 638

### **AUTOMOTIVE TROUBLE-SHOOTING QUIZ-- MATCH WITS WITH THE TEEN-AGE DIAGNOSTIC CHAMPS**

Automotive problems are presented which are based on five of eight malfunctions encountered by the high-school, state-championship teams who competed in the last national finals of Plymouth's Trouble Shooting Contest, held on 20 Jun 1978 in Kansas City, Mo. In this annual competition, originated by Chrysler-Plymouth in 1949, two-person teams of high school students from the 50 states try to identify and correct the

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same malfunctions in identical cars. The winning team is determined by combining a team's repair time, quality of work, and scores from a written test taken earlier. The contests are designed to encourage mechanically-talented students to complete their educations and become auto mechanics. The automotive trouble-shooting quiz covers the following problems: starter will not crank engine, engine cranks but will not start, engine starts but will not idle, left-front turn signal does not operate, and temperature gauge on the dash panel indicates the engine is cold at all times.

by Ray Hill

Publ: Popular Science v214 n3 p130, 135-6 (Mar 1979)  
1979

Availability: See publication

HS-025 639

### **TIRES '79; TIRE INDUSTRY UNDER THE GUN. A WAW [WARD'S AUTO WORLD] SPECIAL REPORT**

U.S. tire manufacturers face challenges in trying to meet the demands of fuel-economy-conscious automakers, recall-conscious government regulators, wage-conscious United Rubber Workers, economy-conscious motorists, and investment-conscious tire-company stockholders. Faced with fuel economy requirements, automakers demand lighter-weight, smoother-rolling tires and wheels. The third generation radial tires have higher inflation pressure and are a few pounds lighter. Michelin and Goodyear are pushing low-profile TRX and Elliptic tires, respectively. These tires take higher inflation (resulting in less rolling resistance), but require a special rim to keep sidewalls from absorbing excessive road shocks. Tire companies are taking two approaches by eliminating spares and cutting wheel weight. Run-flat tires, puncture-sealing tires, and self-supporting tires with reinforced sidewalls that keep sharp edges of the wheels elevated away from the rubber (and requiring a warning system) are potential alternatives to spare tires. The most attractive option is a temporary spare that takes less space than a full-size tire. Another alternative is a deflated-type spare requiring a container of compressed air. Another idea is a thin, full-size tire. Also underway is research to reduce wheel weight. Many cars now are using aluminum wheels. Some companies are investigating reinforced-plastic rims. Tire industry sales are expected to rise 7% to about \$12 billion in 1979. Tire companies worry about new contract demands by rubber workers, about declining demand for cars in 1979 and about possible production shutdowns due to United Auto Workers strikes. The rubber companies hope to bolster their financial positions by entering other businesses. The most astonishing move to diversify is a tentative merger agreement between Firestone and Borg-Warner (automotive parts, chemicals, and air conditioning).

by Douglas J. Oplinger

Publ: Ward's Auto World v15 n2 p83, 85-6 (Feb 1979)  
1979

Availability: See publication

HS-025 640

### **MOST '81 CARS MAY HAVE TUNGSTEN/HALOGEN LAMPS**

Tungsten/halogen (t/h) headlights will be standard equipment on most cars starting with the 1981 model year, if the rest of the industry, as expected, follows Ford Motor Co.'s product-

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planning schedule. Improved fuel economy, rather than better lighting, is the main reason. The t/h cycle consumes less electrical energy for an equal or even greater amount of light than conventional sealed-beam headlights, which enables cars to be equipped with smaller alternators to reduce overall weight. In operation, the alternator also soaks up less hp from the engine when t/h lamps are used. In conventional sealed beams, the lens acts as one large bulb with built-in filament leads. With t/h, the lens encloses another bulb using the t/h cycle. With two bulbs, t/h headlights are more expensive to make, but volume and smaller alternators can offset the added cost. In addition to fuel economy improvements, the t/h lamps will offer better lighting due to the stronger allowable cp (maximum cp up from 75,000 cp to 150,000 cp), achievable with conventional sealed beams only at the expense of a greater power drain on the engine. The whiter light from the t/h lamps also has a greater aesthetic appeal.

by Richard L. Waddell

Publ: Ward's Auto World v15 n2 p88 (Feb 1979)  
1979

At head of title: Technical Takeout.

Availability: See publication

HS-025 641

### **LIGHTS: PT. 1. TO HAVE OR HAVE NOT [AUTOMOTIVE HEADLAMPS, U.S. REGULATIONS]**

The use of quartz-halogen automotive headlights (as used in Europe) as standard equipment on U.S. automobiles is advocated instead of the present conventional sealed-beam headlights. It is stated that U.S. lighting standards are archaic. From measurements and determinations made in 1940, which in turn were based on the technology of 1937 sealed-beam headlamps, the Society of Automotive Engineers has set standards that the National Hwy. Traffic Safety Administration (NHTSA) incorporates by reference in overall Federal Motor Vehicle Safety Standard 108. European lights have a tremendous advantage in effectiveness over conventional sealed beams not only because of their uniformly bright light, but also because of more accurate use of photometrics. Thomas Fender, Jr., a lawyer and lobbyist for the Northwest Headlamp Conference, Inc. which supports U.S. approval for quartz-halogen headlights, maintains that NHTSA has failed to develop any kind of objective performance criteria for forward lighting. It is suggested that NHTSA needs to adopt the International Standard (Economic Commission for Europe) for quartz-halogen headlights. NHTSA has based its previous refusals of European-type quartz lights on a number of factors, including their high initial cost, their incompatibility with mechanical aimers, and glare when improperly adjusted. It is pointed out that the ECE quartz-halogen are easier to aim than conventional lights and that any light, when misaimed, creates a glare problem. NHTSA unexpectedly decided in 1978 to approve sealed-beam tungsten-halogen high-beam headlights of twice the normal output. Under the new regulation, NHTSA will allow a total of 150,000 cp for high beams, but they must be of sealed-beam construction. The standard is applicable only to cars with quad lights that have separate high-beam units. Nevertheless, although the new lights do not make use of the latest quartz photometrics as seen in Europe, it is stated that NHTSA is making progress.

by Larry Griffin

Publ: Car and Driver v24 n9 p93-4, 98, 100, 103 (Mar 1979)  
1979

Pt. 2 is HS-025 642.

Availability: See publication

October 31, 1979

HS-025 644

HS-025 642

### **LIGHTS: PT. 2. WHAT WORKS AND WHAT DOESN'T [AUTOMOTIVE HEADLAMPS]**

Advice is given to the consumer on selecting automotive headlight conversions and auxiliary lights. It is pointed out that in converting from standard sealed-beam headlights to quartz-halogen headlights, there are many different types from which to select (different types, colors, ranges, and purposes). Unless it is impossible to avoid, special lights should not be purchased unless the beam pattern has been observed; various lights from the same manufacturer, ostensibly for the same purpose, are designed to differ completely in their patterns and intensity. Whatever patterns and strengths of special auxiliary lights are under consideration, it is necessary to look for even distribution within a pattern, a sign of good photometrics and thorough development. In general, the deeper any given reflector is, the more efficient its light output. The more fluting a lens has, the shorter and wider its throw. The largest-diameter lamps are likely to make more power from any bulb that gets plugged in than smaller housings. Beyond these considerations, a lamp should be chosen for the motorist's specific needs. Fog lights should throw a short, wide beam with an exceptionally sharp cutoff that runs straight across the top of the pattern. The evenness of the light in fog lamps is very important, as it is with driving and pencil beams. Amber lenses are a good choice for real fog use, but if cornering is the object, clear lenses are probably better. Booster or passing beams are usually smallish rectangular lights that neatly fill in the gaps left by low beams. Wide-beam driving lights, beyond headlight conversions, are probably the most useful of all; their patterns vary more than those of any other family of lights, but ideally they throw a lot of light down the road without sacrificing all spread to the sides. Bulbs for headlights or auxiliary lights are of two outputs (55 watts and 100 watts, the former more practical). Driving and cornering lights should be mounted above the bumper, fog lights below. The use of relays is essential in wiring up a set of high-intensity lights. Care needs to be taken in choosing an accessible on/off switch location, such as on the driver's door.

by Larry Griffin

Publ: Car and Driver v24 n9 p105-11 (Mar 1979)

1979

Pt. 1 is HS-025 641.

Availability: See publication

HS-025 643

### **1977 FATAL TRAFFIC ACCIDENT STATISTICS [UTAH]**

Statistics on fatal traffic accidents in the State of Utah during 1977 (and comparison years) are provided in graphs and tables. The following types of data are presented: national comparative (1977 Utah data, 1976 national data); fatal accidents by residence; 1977 summary; Utah comparative (1976 vs. 1977); county fatalities; county population and accident rate; all accidents by counties; fatal accidents according to time, weather, roadway conditions, seat belt use, vehicle type, accident type, traffic violations, speed limit, objects struck, directional analysis, operator's age and sex, and type of highway; pedestrian accidents (at intersection/not at intersection, pedestrian action, accidents/fatalities by age and sex of pedestrian, operator's age, fatalities contributed to alcohol or other drugs); monthly interstate fatalities; 1940-1977 comparison among vehicle miles/fatalities/fatality rate; accident

statistics (1934-1977); mileage and travel; accidents and accident rates by highway system (1977); fatalities/fatal accidents; traffic trends (1967-1977); urban and rural accident rates; interstate and non-interstate fatality rates; and alcohol-related fatalities by county. In 1977 in Utah, there were 310 fatal accidents involving 360 fatalities compared to respective figures of 225 and 254 for 1976. The fatality rate/100 million vehicle miles was 4.0 in 1977 vs. 3.0 in 1976.

by C. Arthur Geurts; Lillian J. Witkowski; Faye Bennion; Charles J. Bertolina; Monte R. Yeager  
Utah Dept. of Transportation, Div. of Safety  
1978; 36p

Cover title: 1977 Utah Fatal Accidents

Availability: Corporate author

HS-025 644

### **GUARDRAIL/VEHICLE DYNAMIC INTERACTION. FINAL REPORT**

A research program was undertaken to obtain insight into the effects of the modified bumper configurations specified by Federal Motor Vehicle Safety Standard (FMVSS) 215 on the collision behavior of a variety of guardrails and median barriers. FMVSS 215 specifies that automobiles manufactured after 1973 must survive a series of front and rear bumper impact tests without damage to safety-related components. The program was designed to: develop and implement a generalized simulation model capable of depicting the three-dimensional, nonlinear, dynamic response of guardrail/median barrier systems; develop and implement a three-dimensional vehicle model that accounts for the bumper modifications of FMVSS 215 and is capable of three-dimensional interaction with the guardrail/median barrier simulation model; identify, through parametric analysis, selected guardrails and median barriers that are particularly sensitive in their respective performances to FMVSS 215 modifications; and establish whether FMVSS modifications significantly alter barrier performance to a degree warranting barrier modification and/or FMVSS 215 revision. The basic formulation of the GUARD simulation model is presented, and capabilities and applications of the guardrail and vehicle/interaction models are discussed. Validation procedures employed in verifying the GUARD model are described. A summary is provided of the results of numerous test simulations performed as part of the parametric analysis. Recommendations for future analyses and direction are given. Appended are a complete derivation of governing dynamic equations employed in the GUARDRAIL model, a description of the three-dimensional dynamics of the vehicle/interaction model, and detailed descriptions of the computer program input, basic program operations, and program listing. It was concluded that modifications to vehicles produced by FMVSS 215 possibly could have an adverse effect on G2, G4S, and G4W guardrail systems, all of which are equipped with W-section rails. When stiffened, as is the case with the MB2, MB4S, and MB4W median barriers, the bumper effects are negligible.

by R. W. Bruce; E. E. Hahn; N. R. Iwankiw  
IIT Res. Inst., 10 W. 35th St., Chicago, Ill. 60616  
DOT-FH-11-8520  
Rept. No. FHWA-RD-77-29; PB-286 119; IITRI-J6346; 1976;  
242p 14refs  
Rept. for 1 Jul 1974-31 Dec 1975.  
Availability: NTIS



HS-025 645

HSL 79-10

HS-025 645

### **SAFETY BELTS: THE UNCOLLECTED DIVIDENDS**

A sample of ideas is presented in a manual on techniques to increase safety belt usage for use by state legislators and state officials. The potential of police traffic services, accident investigation, traffic records, traffic courts, motor vehicle inspection, driver licensing, driver and traffic safety education, and physicians in promoting seat belt usage is outlined. Legal approaches to the encouragement of safety belt usage are discussed, short of an across-the-board mandatory safety belt usage law. Such laws could include the requirements that belts must be in good working order for a vehicle to pass inspection, that vehicles for hire must have safety belts available and in good working order, and that special classes of drivers (e.g. truck drivers, bus drivers, ambulance drivers) must wear belts for the protection of others. Particular attention is given to legal requirements for belt usage among beginning drivers. Mandatory belt usage by this group would not only decrease the injuries and deaths occurring as a result of their inexperience but also increase the probability of the development of the safety belt habit among new drivers. There is ample evidence that young, inexperienced drivers are worthy of special consideration from the standpoint of licensing. Since it is a fact that young drivers, as a group, are likely to have more crashes, increased belt usage by this group should have a greater payoff than that of any other age group. The linking of belt usage to licensing of the beginning driver is a relatively inexpensive way to promote belt usage. All occupants could be required to wear seat belts when a young person is driving. It is contended that efforts to increase safety belt usage by legal means would stand a better chance of success if they were limited initially to the requirement of belt use by children and youths.

by Patricia F. Waller

Publ: Traffic Safety v79 n1 p8-10, 30-1 (Jan 1979)  
1979; 1ref

Based on "Safety Belts: The Uncollected Dividends," by P. F. Waller, L. K. Li, B. J. Campbell, and M. L. Herman, Univ. of North Carolina, Hwy. Safety Res. Center, May 1977, a manual sponsored by National Hwy. Traffic Safety Administration. Availability: See publication

HS-025 646

### **PROFILE OF THE FATAL PEDESTRIAN RAILROAD ACCIDENT**

The National Transportation Safety Board (NTSB) has completed a study of 269 railroad pedestrian accidents, involving 280 fatalities (attempt to exclude suicides), investigated from 1 Mar 1976 to 30 Oct 1977. Based on the 280 fatalities, a composite profile of fatal trespasser accidents was developed consisting of the following 11 elements: accidents occurred most frequent on Saturday; the typical victim was a male, over 15, who had been drinking heavily, and was not a transient; clear weather and good visibility prevailed, with a straight track and flat surface; and the accident site consisted of a main line with multiple tracks, in a built-up area (commercial, industrial, and residential), with a high number of trains daily. It was found that 82% of the accidents were in unfenced areas. Selective fencing is suggested as an effective countermeasure. The NTSB recommends that the Federal Railroad Administration develop criteria for the selection of fence sites. In addition to the number of tracks, the frequency of trains on the tracks, and built-up areas nearby, the

proposed criteria should consider such items as the direction and purpose of pedestrian traffic movement and the topography of the site.

Publ: Traffic Safety v79 n1 p14-5, 29, 30 (Jan 1979)  
1979; 2refs  
Availability: See publication

HS-025 647

### **DDC [DEFENSIVE DRIVING COURSE] SUPPLEMENT LAUNCHES ALCOHOL CAMPAIGN**

A two-hour alcohol information course, "Drinking, Driving, and You," has been launched by the National Safety Council. The ready-made educational program is intended for any group interested in ameliorating the problem of alcohol abuse, and can be given separately or as an extension of the Council's Defensive Driving Course (DDC). The course spells out the facts about the build up of alcohol concentration after a series of drinks, the effect of certain concentrations on the brain, and the effect of alcohol on a person's perceptual, judgmental, and psychomotor skills that renders him unfit to drive. A 20-min color film, "So You Think You Can Drink and Drive", is a documentary of an actual drunk-driving test conducted under the supervision of the Los Angeles Police Dept. Other visual aids include a colorful, 10-page flip chart, with excellent graphics, and a flannel board stage. For the student, there is a two-color 40-page student handbook with a section which expands on the information presented in the lecture portion of the course; a section containing student outlines; two quizzes that measure alcohol knowledge before and after the course, and exercises determining blood alcohol concentration (BAC); and a section about problem drinking and additional information on alcohol, such as its long-range effects. The pre-test and post-test provided in the handbook are optional. On the back cover of the handbook is a serially-numbered graduation card on the back of which is a handy BAC calculator. Although the problem drinker as such is not discussed in the course, a list of state and national organizations providing assistance for the problem drinker is provided in the instructor's manual. Any DDC instructor, experienced with the DDC format, should be able to teach the course effectively without special training.

by Chris Imhoff

Publ: Traffic Safety v79 n1 p18-9, 31-2 (Jan 1979)  
1979  
Availability: See publication

HS-025 648

### **AUTOMOTIVE FUEL ECONOMY AND EMISSIONS PROGRAM. FINAL REPORT**

An effort was undertaken to generate experimental data to support assessment of the relationship between automobile fuel economy and emissions control systems. Tests were made at both the engine and vehicle levels on a 1975 Plymouth Valiant with 6-cylinder engine. In Environmental Protection Agency certified tests, this vehicle/engine combination gave a fuel economy in the Federal urban and highway driving cycles which was among the best achieved in the 3500-lb inertia weight class. By selecting a vehicle from among the best fuel economy cars, any positive results achieved during the program are more meaningful. A vehicle in the 3500-lb class was chosen since lighter vehicles seem to be the trend of the future. Detailed investigations were made on cold-start emission



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devices, exhaust gas recirculation (EGR) systems, and air injection reactor (AIR) systems. Based on the results of engine tests, an alternative emission control system (electrically-heated catalyst unit) and modified control (EGR/spark advance) strategy were implemented and tested in the vehicle. The stock AIR strategy and stock EGR delay time were maintained. With the same fuel economy and NOx (nitrogen oxides) emissions as the stock vehicle, the modified vehicle reduced hydrocarbon and carbon monoxide emissions by about 20%. By removing the NOx emissions constraint, the modified vehicle demonstrated about 12% better fuel economy than the stock vehicle.

by Mack W. Dowdy; Ronald L. Baisley  
California Inst. of Tech., Jet Propulsion Lab., 4800 Oak Grove Dr., Pasadena, Calif. 91103  
DOT-RA-75-41  
Rept. No. NASA-CR-157604; JPL-78-21; N78-32426; 1978; 211p 47refs  
Rept. for Jun 1975-Dec 1976.  
Availability: NTIS

HS-025 649

**AUTOMOBILE INSURANCE LOSSES, NON-COMMERCIAL COLLISION COVERAGES. VARIATIONS BY MAKE AND SERIES, VANS, PICKUPS, AND UTILITY VEHICLES. 1978 MODELS DURING THEIR FIRST YEAR, 1977 MODELS DURING THEIR FIRST TWO YEARS**

Variations in frequencies and sizes of collision claims for damage to individual 1977 and 1978 model year vans, pickups, and utility vehicles are reported, based on the experience of 1977 models in the calendar period Sep 1976 through Aug 1978, and of 1978 models in the period Sep 1977 through Aug 1978. Collision coverage and loss data were supplied by Aetna Life and Casualty, Allstate, Kemper, Liberty Mutual, Nationwide, Prudential, State Farm, and Travelers insurance companies. Appended are descriptions of the sources and nature of the data; a discussion of data analysis methods; definitions; a list of vehicle series designations by class, make, and series; and detailed claim frequency and average loss payment per claim results. The frequencies of collision claims for the three groups of vehicles were very similar. The 1978 model year utility vehicles had the highest claim frequency, 10.3 claims/100 insured vehicle years; the 1978 vans had the lowest, 9.6 claims/100 vehicle years. The average loss payment per claim, varied greatly among the three vehicle groups. It was highest (\$1020) for 1978 utility vehicles, a figure 54% greater than that for 1978 vans, which had the lowest average loss payment per claim (\$663). In each model year, vans had the lowest average payment per claim, followed by pickups and utility vehicles. The 1978 utility vehicles had the highest average loss payment per insured vehicle year (\$105), and the 1978 vans had the lowest (\$64). The Jeep CJ-5 Universal and the Jeep CJ-7 Universal had average loss payments per insured vehicle year exceeding \$100 in both model years. Within each vehicle group, there was great variation in the average loss payments per insured vehicle year for individual makes and models.

Highway Loss Data Inst., Watergate 600, Washington, D.C. 20037  
Rept. No. HLDI-V78-1; 1979; 39p 2refs  
Availability: Corporate author

HS-025 731

**HIGHWAY AIR QUALITY IMPACT APPRAISALS. VOL. 1. INTRODUCTION TO AIR QUALITY ANALYSIS. FINAL REPORT**

Basic information is provided to transportation planners and engineers for analyzing local or regional air quality impacts. Subjects discussed include basic characteristics, sources, removal processes, and air quality standards for five pollutants (hydrocarbons, nitrogen oxides, sulfur oxides, particulates, and photochemical oxidants); emissions; control devices, and legislation on vehicular emissions; nonvehicular anthropogenic and natural sources of those five pollutants; construction of emissions inventories; relative contributions of vehicular emissions to air quality at regional, urban, and roadway spatial scales; physical and chemical processes that affect pollutant concentrations; an assessment of types of air quality models including algebraic (Gaussian), trajectory, and grid numerical models; and the design and use of air quality monitoring programs. Appended is a list of air quality models and references in which they are described. A glossary and subject index are provided. This report may be useful as a general reference work, particularly on the subjects of emissions, atmospheric processes, and air quality models.

by R. I. Pollack; T. W. Tesche; S. D. Reynolds; M. J. Hillyer; T. N. Jerskey; M. J. Meldgin  
Systems Applications, Inc., 950 Northgate Drive, San Rafael, Calif. 94903  
DOT-FH-11-9143  
Rept. No. FHWA-RD-78-99; EF78-28R; 1978; 418p refs  
Vol. 2, Guidance for Highway Planners and Engineers, is HS-025 732.  
Availability: NTIS

HS-025 732

**HIGHWAY AIR QUALITY IMPACT APPRAISALS. VOL. 2. GUIDANCE FOR HIGHWAY PLANNERS AND ENGINEERS. FINAL REPORT**

Guidance is provided for highway planners and engineers in selecting and designing air quality analyses to evaluate the impact of a land use or transportation planning project. The legal framework within which such analyses are performed is described. Available resources are reviewed for analyzing air quality (techniques for estimating travel demand, highway usage, vehicular and nonvehicular emissions inventories, and resultant air quality). The various issues that arise in evaluating land use plans, transportation policies, and facility and operation plans at both regional and subregional levels are described, including the selection of the appropriate spatial and temporal scales for the analysis, the accuracy necessary in the analysis methods, the application of screening procedures to determine the level of analysis required, the comparison of air quality predictions to legal requirements on air quality, and the reporting of modeling results. Summaries of relevant air quality and transportation legislation are appended. This report is designed to familiarize the highway planner or engineer with

the issues that must be considered and allow him to determine the appropriate air quality analysis method.

by R. I. Pollack; T. W. Tesche; T. Austin  
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Calif. 94903; JHK and Associates, 1617 E. 17th St., Santa  
Ana, Calif. 92701  
DOT-FH-11-9143  
Rept. No. FHWA-RD-78-100; EF78-34R; 1978; 164p refs  
Vol. 1, Introduction to Air Quality Standards, is HS-025 731.  
Availability: NTIS

## HS-025 733

**MOTOR CARRIER ACCIDENT INVESTIGATION. NL INDUSTRIES, INC. AND THURSTON MOTOR LINES, INC. ACCIDENT, APRIL 27, 1978, MORGANTON, NORTH CAROLINA**

On 27 Apr, 1978, Thursday, at 4:10 AM, on Interstate 40, 7 mi west of Morganton, N.C., a tractor-semitrailer combination, operated by Southern Screw Div. of NL Industries, Inc. (N.Y., N.Y.), collided with the rear of a slower-moving tractor-semitrailer combination, operated by Thurston Motor Lines, Inc. (Charlotte, N.C.), which was in the right lane of travel. Upon collision, the Thurston truck veered to the left, crossed one lane of travel, ran partially onto the grass median, then returned to the roadway, coming to rest in the right lane and partially on the right shoulder. Its final position was 756 ft from the point of impact. The NL truck, after the collision, continued its forward motion straight ahead, and came to rest 432 ft from the point of impact. The driver of the NL truck was crushed in the cab of his tractor and killed instantly. The driver of the Thurston truck was injured. Property damage was \$32,600. The probable cause of the accident was inattention as the result of fatigue or use of drugs on the part of the NL driver, and excessive speed (estimated to be between 70 mph and 75 mph). The Thurston driver claimed that he was traveling at 45 mph prior to the accident. The NL driver had covered about 700 mi to the accident scene in 17 hr without any appreciable rest. Sometime during the trip, he relied on amphetamines to stay awake. The speed of the NL truck and the slower-moving and mechanically-deficient Thurston truck contributed to the serious consequences of the rear-end collision. Both drivers had previously had their licenses suspended and revoked and both drivers had prepared false logs, indicating a callous disregard for compliance with state and Federal regulations. The Thurston driver was operating without a valid chauffeur's license, a fact unknown to his employer.

Bureau of Motor Carrier Safety, Washington, D.C. 20590  
Rept. No. BMCS-78-1; 1979; 17p  
Availability: Corporate author

## HS-025 734

**1977 NATIONAL CONFERENCE ON RAILROAD-HIGHWAY CROSSING SAFETY PROCEEDINGS. AUGUST 23-25, 1977, UNIVERSITY OF UTAH**

A compilation is provided of presentations at a conference to promote implementation of grade crossing safety improvement projects authorized by Federal, state, and railroad industry programs. In the first session, bimodal safety and efficiency of grade crossings were addressed from the viewpoints of the National Transportation Safety Board, the state (Utah) department of transportation, the railroad industry (Burlington

Northern, Inc.), Amtrak, labor (Brotherhood of Railroad Signalmen), and the Federal Hwy. Administration. The second session treated the strengths and weaknesses of the national grade crossing safety program (Federal, state, and railroad industry viewpoints), and the roles of labor, the media, and education in crossing programs. The first part of the third session was concerned with establishing new priorities for crossing safety programs and included presentations on the status of the National Inventory data file on U.S. railroad-highway crossings, on passenger considerations, and on the Canadian government's role; the second part of the session dealt with the administration of grade crossing programs, with individual treatment of split jurisdictions, rail relocations, and the systems approach. New directions were discussed in the final session which included the following presentations: research projects (Manual on Uniform Traffic Control Devices, use of the National Inventory data file for state rail planning activities, Canadian research, U.S. research), role of the railroad signal department (the Santa Fe Railway Co. approach, the Seaboard Coast Line Railroad approach), and crossing warning systems and surfaces and their proper application (separate treatment of equipment, application, and surfaces).

Department of Transportation, Washington, D.C. 20590  
1977; 133p refs  
Availability: Corporate author

## HS-025 735

**DYNAMIC TESTING OF LUMINAIRE SUPPORTS WITH AN IMPROVED PENDULUM IMPACT FACILITY. FINAL REPORT**

Results are presented of a study leading to the development of a validated pendulum substitute for the full-scale tests of luminaire supports as required by current American Assoc. of State Hwy. and Transportation Officials (AASHTO) specifications (Federal Hwy. Administration Notice N 5040.20, 14 Jul 1976). The resulting pendulum test procedure adequately simulated a 20-mph, full-scale, head-on test with a pre-1973 Veggie design vehicle in terms of change of momentum, structural deformation, impact duration, peak loads, and failure modes. As a byproduct of this effort, added insight has been obtained on pendulum and target structure parameters that may be critical in affecting the momentum transfer of the impacting vehicle. As a minimum requirement to ensure pendulum test results which are compatible with full-scale tests, the pendulum nose configuration adopted for the design vehicle must possess comparable mass, aggressivity, and stiffness to the design vehicle, must result in identical target failure modes, and must reproduce faithfully the force-time, force-deformation characteristic of the given design vehicle with the given target. Minimally required are the avoidance, in calibrating the test facility, of target structures known to exhibit extensive scatter, and modification of target structures known to exhibit extensive scatter in fracture loads to improve their repeatability.

by D. B. Chisholm; L. C. Meczkowski  
Federal Hwy. Administration, Protective Systems Group,  
Washington, D.C. 20590  
Rept. No. FHWA-RD-78-204; 1978; 115p 10refs  
Availability: NTIS

October 31, 1979

HS-025 739

HS-025 736

### **IMPLEMENTATION AND EVALUATION OF A MOVING MERGE CONTROL SYSTEM IN TAMPA. FINAL REPORT**

The configuration and evaluation are described of an automated moving merge control system in Tampa, Fla. (Ashley St. entrance ramp to Interstate Hwy. 275). The traffic control system, known as the green band system, was designed to provide a visual indication of the existence of the acceptable gaps in the freeway traffic stream which then could be used as advisory information for vehicles on the ramp. Its purpose is to promote a more efficient match between the arrival of ramp vehicles and freeway gaps in the merge area. The operational performance characteristics are described; they generally relate to the quality of traffic operations as measured on the ramp, the freeway, and the merge area. The safety considerations, including driver stress, traffic turbulence, and accident experience, are addressed. Public acceptance factors are presented, based on two questionnaire surveys. A cost/benefit analysis of a number of alternatives for operational and safety improvements (green band system, ramp metering system, and ramp reconstruction) is provided. From a mechanical, electrical, computer, and software technological point of view, the moving merge system was operated successfully. The system improved the merging operation within the area of the acceleration lane, and improved traffic operations in the freeway right lane immediately upstream of the merge area. A three-year comparison of accidents before and after installation of the system showed that all accidents in the merge area had been reduced by 38%, rear-end collisions by 45%, and accidents in the freeway right lane upstream of the merge area by 26%. It is concluded that most drivers found the system useful. Although most drivers understood how to use the system, many drivers chose not to use the rampside-presented information. The system did not produce an adverse effect in terms of driver stress. The best cost-benefit ratio was found for the ramp metering system. It is stated that the use of the green band concept should be limited to those applications where redesign of the ramp and merging area is impractical, but safety improvements on the freeway and in the merge area are needed.

by K. G. Courage; J. A. Wattleworth; J. K. Sturgis; G. C. Price; S. L. Shaw; C. S. Bauer  
University of Florida, Transportation Res. Center, Gainesville, Fla. 32611  
DOT-FH-11-8285  
Rept. No. FHWA-RD-78-29; 1978; 103p 10refs  
Also sponsored by the Florida Dept. of Transportation and the City of Tampa.  
Availability: NTIS

HS-025 737

### **EFFECT OF CARGO SHIFTING ON VEHICLE HANDLING. FINAL REPORT**

A study was undertaken to determine if and to what degree shifting cargoes affect the handling of heavy vehicles. The first phase involved surveying several trucking companies to determine the procedures used by the industry when transporting shifting cargoes. The findings helped in planning a full-scale test program in which two types of cargo were used, water in tank trailers, and hanging beef halves in refrigerated vans. Handling performance was compared to that of a nonshifting-cargo vehicle. The same tractor was used to tow

the different loads. Tests were conducted in braking, cornering, and combined maneuvers. Acceleration measurement and driver reaction were used to compare the handling performance. It was concluded that some handling deterioration occurred in almost every case of shifting cargo. The degree of stability problems encountered when transporting partial loads of liquid cargo can be reduced through driver training and instruction, and by recommending that this type of operation be kept to a minimum. The problems with transporting swinging meat loads could be ameliorated by driver training and instruction and by a concerted effort on the part of packers and shippers to pack each load as tightly as possible.

by C. Culley; R. L. Anderson; L. E. Wesson  
Dynamic Science, Inc., 1850 W. Pinnacle Peak Rd., Phoenix, Ariz. 85027  
DOT-FH-11-9195  
Rept. No. FHWA-RD-78-76; 3989-78-22; 1978; 139p  
Rept. for Oct 1976-Dec 1977.  
Availability: NTIS

HS-025 738

### **EVALUATION OF THE WRITTEN TEST AND THE RIDING SKILL TEST USED IN THE MOTORCYCLE RIDER COURSE**

Some of the data collected on a sample of 225 students on the written and riding skill tests they took as part of a Motorcycle Rider Course administered by the Univ. of Illinois during Apr-Sep 1977, were used to evaluate the statistical properties and overall effectiveness of the tests. The free motorcycle riding instruction supported by the Illinois Dept. of Transportation, was offered to residents of an 11-county area; of over 1000 persons completing the course, most obtained a motorcycle operator's license. The written test was administered on the first day, prior to any instruction, and on the last day of instruction so that the change in knowledge due to the course could be measured. The range riding skill test was given on the last day of instruction. The curriculum and the tests were those of the Motorcycle Safety Foundation. Based on the analysis of the data, it is recommended that some revision of the written test would be appropriate. A number of test questions could be safely omitted since the information is already known to the students prior to taking the course. Some items on the written test are ambiguous and require revision or deletion. Other questions require review by the instructors to insure that proper emphasis is placed on them during the course. The reliability of the written test indicated lower internal consistency reliability values (pre-test and post-test) than was desirable. In the riding skill test, exercises pertaining to controlling the engine, operating the controls, stopping quickly, and weaving could be omitted to reduce time and administration costs without any significant loss in overall reliability.

by R. G. Mortimer; E. A. Satrun; D. L. Gilliland  
University of Illinois at Urbana-Champaign, Dept. of Health and Safety Education, Champaign, Ill. 61820  
Rept. No. Safety-RR-78-1; 1978; 16p  
Availability: NTIS

HS-025 739

### **SUOMEN TIELIIKENNEONNETTOMUDET VUONNA 1977, LISANA ERAITA TIETOJA VUODESTA 1958 ALKAEN (ROAD TRAFFIC ACCIDENTS IN FINLAND 1977, WITH SOME**

### ADDITIONAL FIGURES STARTING FROM THE YEAR 1958)

Tables and graphs provide statistical data on road traffic accidents in Finland in 1977, as well as some time-series accident data for the years 1958 through 1977. Included is a table of statistics for road traffic accidents in some other European countries during 1976. The source material is information on traffic accidents reported by the police to the Central Statistical Office. Data are provided on motor vehicle registrations; fatalities; injuries; pedestrian, bicyclist, mopedist, and motorcyclist fatalities and injuries, by age groups; vehicles involved in accidents; fatalities and injuries per 1000 cars and per 100,000 mean population, by province; fatalities and injuries by month, day, hour; accidents involving injury to persons by type of accident; pedestrian action at the time of accidents at railroad crossings; fatalities and injuries according to road-user group of those intoxicated; and road traffic accidents and their consequences per 100 million vehicle kilometers. The 1958-1977 data include total number of fatalities and injuries, number/1000 motor vehicles, number/100,000 mean population, number/1000 road traffic accidents, and number by age groups.

Liikenneturva, Helsinki, Finland  
1978; 37p  
Text also in Finnish.  
Availability: Corporate author

HS-025 740

### NEW RESEARCH ON THE ROLE OF ALCOHOL AND DRUGS IN ROAD ACCIDENTS

A state-of-the-art review of alcohol and other drugs in relation to traffic safety is presented, examining the research results obtained since a 1968 report on the subject by the Organisation for Economic Co-operation and Development (OECD). The examination of the drug problem is limited almost entirely to a discussion of the epidemiological evidence. The alcohol problem, on the other hand, is followed through to an examination of the information related to drinking-driving countermeasures and their effectiveness. The subject is treated in the following five sections: examination of statistical and design considerations necessary for an accurate assessment of the interaction of drugs, alcohol, and traffic; evaluation of the extent and nature of the alcohol and drug problem with respect to traffic safety; identification of the driver at risk and the effects of alcohol and/or drugs on driving performance; examination of countermeasure programs; and conclusions and recommendations. Appended are a recommended methodology for roadside surveys of drinking-driving behavior, a slightly modified version of the methodology established by OECD in 1972; and a summary of available devices for measuring driver alcohol levels and their accuracy. The principal recommendation specifies that the major countermeasure activities continue to be focused on efforts to resolve the alcohol problem in traffic safety. The major task related to drug and traffic safety is the design of valid research studies to establish the extent and nature of drug use among drivers and pedestrians. The most urgent need in this area is the development of more sensitive and practical assay techniques.

Organisation for Economic Co-operation and Development, Road Res. Group, 2, rue Andre-Pascal, 75775 Paris Cedex 16, France  
Rept. No. OECD-40.927-1978; 1978; 154p refs  
Availability: Corporate author \$9.00

HS-025 741

### HOW TO IMPROVE YOUR BRAKING TECHNIQUE

Effective motorcycle braking technique can be learned through practice. The front brake can provide up to 75% of stopping power if the cycle is upright on a stable surface. The lever should be in line with the forearm, with the cable lubricated so that two-finger pressure can operate it. The rear brake should lie directly under the sole of the foot, with the pedal moving about 3/4 inch before it activates the brake. Careful adjustment and repositioning, if necessary, of the lever and pedal are vital to effective operation. The rear brake should be applied an instant before the front, for stabilization; downshifting quickly through the gears while braking takes advantage of engine compression, an effect provided more strongly by a four- than by a two-stroke engine. Operating the front brake and throttle while downshifting is done by rolling the throttle on and off with the side of the thumb. Wheel lockup must be avoided; practicing stops at gradually increasing speeds while noting the braking pressures and stopping distances required will familiarize the cyclist with the critical point between maximum braking and wheel lockup.

by Bill Hampton  
Publ: Popular Mechanics v151 n3 p41-2 (Mar 1979)  
1979  
Availability: See publication

HS-025 742

### TWILIGHT [DANGERS OF DRIVING]

The hazards of driving in evening twilight are suggested by the fatality statistics: nearly 1/3 of all auto accidents occur from 4 to 8 p.m., and 1/3 of all traffic-caused pedestrian deaths. Visual adaptation to increasing darkness lags, decreasing the driver's depth perception, and fatigue at the end of the working day also affects vision and alertness. Alcohol, poor health and problems of aging decrease driving efficiency. Low-beam headlights should be turned on at sunset, or whenever light conditions become less than optimum. Other recommendations for twilight driving include: careful upkeep of car's head and taillights, reflectors, windshields and wipers; interior illumination kept to a minimum; no smoking; constant watchfulness for pedestrians; decrease in speed by at least 10 mph at dusk; pulling off the road for a rest for a few minutes until full darkness; and, when possible, having a car in a visible color such as white, off-white or yellow, the most easily seen in twilight conditions. The average driver experiences more visual difficulty at dusk than at night with headlights.

by Michael J. Mooney  
Publ: Popular Mechanics v151 n3 p116-7, 190, 192 (Mar 1979)  
1979  
Availability: See publication

HS-025 743

### HOW TO STOP STALLING

Letters requesting advice about problems of engine stalling indicate that 85% of the cars experiencing stalling have a malfunctioning emissions control or vacuum-related component as the cause. Such problems have resulted in two recalls and one ongoing investigation by DOT; cars involved in such recalls should be taken to a dealer. For other cars, the first step should be an engine tuneup, concentrating on the following

procedures: a compression test with the engine warm, to establish if stalling results from excessive carbon in the engine; servicing sparkplugs, cables, ignition timing and distributor parts, and adjusting the point dwell of nonelectronic ignition systems; testing the automatic choke to be sure it isn't sticking, and setting it to the manufacturer's specifications; setting slow (curb) and fast-idle speed to specification, overhauling carburetor and checking throttle linkage; checking fuel system; seeing that pollution control (PCV) valve is not clogged; checking for weak fuel pump. If these measures fail to prevent stalling, the problem may be one of the following: an inoperative thermostatic air cleaner; vacuum loss around the carburetor and intake manifold; split, kinked or loose vacuum hoses; damaged vacuum break; inoperative manifold heat-control valve or vacuum-controlled fuel vaporization valve; leaking exhaust-gas recirculation (EGR) valve; or cracked or loosely connected ignition wires. Instructions are given for checking the thermostatic air cleaner, tracking down vacuum loss, and testing heat (early fuel evaporation, or EFE) and EGR valves. Detailed drawings illustrate each component to be investigated. Further solutions to the stalling problem may be found in service bulletins, obtainable through a service manager for the particular make of car.

by Mort Schultz

Publ: Popular Mechanics v151 n3 p128-30 (Mar 1979)  
1979

At head of title: Saturday Mechanic.

Availability: See publication

HS-025 744

### THE 12 MOST-ASKED QUESTIONS ABOUT RV [RECREATIONAL VEHICLE] TIRES

Definition of an off-road tire, and information about price, advantages and disadvantages of specialized tires for recreational vehicles are offered as replies to a series of questions. Since most owners of RV's with four-wheel drive spend much more time on the highway than off, the off-road tire should be designed for both kinds of service. Off-road is defined as the outback where chunks of rock, deep ruts, mud and sand prevail; regular tires suffice on average hard-packed country roads. The conventional heavy-duty truck tire is a good compromise. Tread pattern for off-road tires, open and deep-grooved, comes in conventional or traction design (snow tires). The wide soft tread paddle tire for sand and mud would wear rapidly in highway use. For a vehicle used often for both areas, the most practical plan is two sets of tires and of wheels, to avoid mounting and demounting. Off-road traction snow tires are best for snow, adequate for other terrain (rocky, sandy, muddy) but not as comfortable on paved roads. For driving on ice, tire chains are best. Using wider tires than recommended by the car's manufacturer can involve modifications and, in some cases, unnecessary wear on the engine. As tires of the same size designation may not have the same overall diameter, tires should not be mixed on four-wheel drive vehicles; drive-train damage may result. Radial tires are best and strongest; belted-bias a second choice; bias tires, the least expensive, not suitable for extensive off-road use. Before the vehicle is fitted with tires having a heavier load range, the weight limit should be checked on the axle rating label attached to the cab. The required tire load range can be determined by having the loaded vehicle weighed, one axle at a time, dividing the weight by the number of tires on the axle, then using a load and inflation table, available at tire dealers

or from the Tire Industry Safety Council, Washington, D.C., 20004.

by Mort Schultz

Publ: Popular Mechanics v151 n3 p106-7, 176 (Mar 1979)  
1979

Availability: See publication

HS-025 745

### WHY EATON GOT OUT OF THE AIR-BAG BUSINESS

Investment in mandated markets has proved to be risky, affected by start-stop Federal programs and inconsistent legislation. Easton Corp., pioneer developer of the air bag, has given up the program after spending 13 years and more than \$20 million on research; Allied Chemical has also discontinued work on inflation systems. Current rulings allow either air bags or automatic seat belts to meet Federal standards up to 1984; the cheaper, less controversial belts are assumed to be a probable choice, with air bags as an option. Production of a reliable, long-lasting air bag requires a higher degree of technology than that of most other car components. Questions of price and liability insurance have not been settled. Indications are that the three-point shoulder belt, buckled by the wearer, is more effective. The 1971 mandate for passive restraint systems in all new cars with a 1974 deadline did not allow enough lead time, producing an industry backlash. Similar confusion resulted when the anti-skid truck brake was mandated prematurely, before complete development, and got a quick reputation for unreliability. Work on air bags is continuing, with Talley Industries, Thiokol Corp. and the Hamill division of Firestone, in spite of adverse proposed legislation and uncertainty about environmental and liability problems. Second- and third-generation air bags are a possibility for cars in the mid-eighties.

by Donald D. Holt

Publ: Fortune v99 n5 p146-9 (12 Mar 1979)  
1979

Availability: See publication

HS-025 746

### RECREATIONAL VEHICLES. PART 1, [TRAILED TYPES]

A definition is made of types of recreational vehicles: the trailed, the motorized or self-propelled (truck or slide-in campers and motor homes), and mobile homes, which are now designated "manufactured housing." The varieties of trailed types are considered here; a later article will deal with self-propelled (motorized) types. Conventional travel trailers can be towed by an auto, van or pickup truck; fifth wheel travel trailers have a raised forward section over the box of a pickup truck with a fifth wheel hitch mounted in the truck bed; fold-down camping trailers have plastic or fabric walls which fold down for travel and open out when set up for use. These last are the lowest-priced, smallest and lightest, varying from about 1000 to over 2000 pounds, with a wide range of facilities. Solid-body trailers are more suitable for long periods of time; they may or may not be "self-contained" with all necessary facilities for living a limited period of time without being attached to any outside services. The fifth-wheel trailer has similar facilities in less total length, but requires a pickup truck or especially adapted vehicle for towing. Folding camping trailers are priced from \$1475 to \$3025, and fifth-wheel

trailers from \$4055 to 11,570 and "Conventional" trailers from \$4055 to \$9150. Suggestions for consideration before making a purchase decision are offered, and a number of informative books and magazines are recommended.

by Carl Edwards  
 Publ: Consumers' Research Magazine v62 n3 p11-4 (Mar 1979)  
 1979; 4refs  
 Availability: See publication

HS-025 747

**MEDICALLY IMPAIRED DRIVERS: AN EVALUATION OF CALIFORNIA POLICY. FINAL REPORT TO THE LEGISLATURE OF THE STATE OF CALIFORNIA IN ACCORD WITH CHAPTER 764--1976 REGULAR LEGISLATIVE SESSION (SENATE BILL 2033--GARCIA)**

A study was made to determine the justifiability of Calif. Dept. of Motor Vehicles (DMV) policies with respect to drivers having mental or physical conditions affecting their ability to drive safely. Disabilities considered included neurological disorders which may cause lapses of consciousness or control; diabetes mellitus; cardiovascular or cerebrovascular disease; conditions associated with aging; miscellaneous disease categories; excessive alcohol use; excessive drug use (including drugs used as medication); mental or emotional illness; and mental retardation. Approaches used included a review of traffic safety literature, a compendium of medical opinion and data, a review of laws and administrative policies in Calif. and other states and countries relating to impaired drivers, a presentation of statistics relating to the role of impairment in Calif. accidents, an experimental study of the effect of three types of DMV treatment (formal probation, informal probation, and no action) on accident records of subjects with lapses of consciousness or other physical or mental impairments, and opinion surveys of the general driving population and impaired drivers. It is concluded that the identification and driver's license control of medically disabled drivers fulfills an essential public safety need and should be continued; further recommendations are made for clarifying information and instructions given to drivers and physicians, for protecting the rights of the subjects, and for making greater use of license restrictions instead of refusing licenses. Further research should be done on the medical reporting law, and the form should be modified to include more comprehensive and relevant medical information. There is not enough evidence to indicate that the benefits of a medical advisory board outweigh the costs.

by Mary K. Janke; Raymond C. Peck; Dell R. Dreyer  
 California Business and Transportation Agency, Dept. of Motor Vehicles, 2415 1st Ave., Sacramento, Calif. 95818  
 Rept. No. CAL-DMV-RSS-78-67; 1978; 379p refs  
 Availability: Corporate author

HS-025 748

**CONSUMER DECISION PROCESSES IN AUTOMOBILE PURCHASING: AN EXPLORATORY STUDY**

A pilot study is offered of consumers' decision processes in choosing a new automobile, focussing on the how and why of the decision process with emphasis on psychological elements such as perception, cognition and affect. The purpose is to

establish causality among decision stages and to develop sequence of stages representing time priority and the influence of one stage on the other. General information influences decisions include extent of knowledge, confidence in several different information sources (advertising, car magazines and newspaper articles, "Consumer Reports", dealers and salesmen, friends, garagemen, and service station men), initiation of word of mouth, and salience of three different word-of-mouth sources (dealers and salesmen, friends and family, service station attendants). Variables influencing brand choice processes are advertising breadth (number of different media one is exposed to), advertising rate (number of exposures), attitude, awareness, car literature, confidence, favorableness of word-of-mouth, intention, ownership, predisposition, representativeness (of the subproduct class), satisfaction, and word-of-mouth rate. These variables were measured for each of three brands, Maverick, Toyota and Volkswagen, both static and dynamic models of car buying. Appended are operational definitions of variables, frequency and percentage distributions, and examples of Tau computations.

by Terrence V. O'Brien  
 Marketing Science Inst., 14 Story St., Cambridge, Mass. 021  
 Rept. No. MSI-PRR-76-121; 1976; 102p  
 Availability: Corporate author

HS-025 749

**SCHOOL BUS MAINTENANCE OUTLINED. CALIFORNIA TRANSPORTATION SUPERVISOR DISCUSSES COSTS AND PROCEDURES**

An overview is presented of a school bus maintenance program, together with the repair history of one vehicle. Elmer Bequette, transportation supervisor for the Ocean View School District in Huntington Beach, Calif., provided information on his fleet of buses, whose advanced average age, years of use, may be partly due to the fact that Ocean View buys only a few vehicles per year, the new buses becoming additions to the fleet rather than replacements. Of the 80-vehicle fleet including buses, trucks and cars, 28 buses carry regular, mentally gifted, handicapped and Head Start class members. The vehicles include transits, requiring a special license; 72-passenger conventionals; 66 passenger conventionals with electric clutch; 12-passenger minis accommodating two wheelchairs; 16-passenger minis; and 22-passenger minis. Information is provided on maintenance records, mileage, engines, drivetrains, tires and bodies. The inspection and preventive maintenance program involves a preliminary check and inspection report by the driver each day on tires, fluid levels, lights, mirrors and emergency exits; an inspection during fueling of tires, oil, water, etc.; and an inspection every three days or 2,000 miles by a mechanic, including a check of undercarriage and brakes. Weekly inspections by a qualified preventive maintenance mechanic will shortly be required by new Calif. law. The addition of an AM/FM radio on every new bus has improved student behavior. A breakdown of approximate costs is presented for the 1958 International/Wayne passenger bus. Assuming costs for the first five years to have been approximately \$420, total repair costs for 20 years have been \$8400.

Publ: School Bus Fleet v24 n1 p12, 14, 16, 19 (Feb/Mar 1979)  
 1979

Availability: See publication

HS-025 750

# AN INVESTIGATION OF THE RETAIL USED MOTOR VEHICLE MARKET: AN EVALUATION OF DISCLOSURE AND REGULATION

An investigation was conducted into the effects of disclosure requirements for used vehicles, suggested by the similarity between the proposed Federal Trade Commission (FTC) rule (1976) and the existing Wisconsin disclosure regulation (1972). Information was sought on the overall nature of the used vehicle retail transaction from the perspective of both the consumer and the dealer, and on the impact of the Wisconsin dealer disclosure regulation. Because this regulation requires more than disclosure (disclosure and mandatory safety repair) comparison was also made of Wisconsin with Iowa, which requires safety inspections in all used vehicle sales but no additional disclosure, and with Minnesota, where neither disclosure nor inspection is required. Data were developed to determine the effects of disclosure on consumer and dealer behavior, market structure and used vehicle prices, and on enforcement mechanisms. An overall cost-benefit analysis distills the findings and describes the effects of disclosure regulation. Results are seen to be lower purchase prices and repair costs, improved information for consumer decision-making, safety benefits, and benefits from the dispute resolution system and the complaint handling and enforcement activities of the Dept. of Motor Vehicles (DMV) Dealer Inspection Unit.

by John R. Nevin; David M. Trubek  
University of Wisconsin; Center for Public Representation,  
520 University Ave., Madison, Wis.  
1977; 229p refs  
Prepared for the Federal Trade Commission hearings,  
Washington, D.C., 25 Apr 1977.  
Availability: Corporate author

HS-025 751

# METHODOLOGY OF POWER COMPARISON OF MOTOR VEHICLES (UBERLEGUNGEN ZUR METHODIK DES ENERGETISCHEN VERGLEICHES VON STRASSEN FAHRZEUGEN)

In an energy comparison of battery-powered vehicles with those of conventional drive, a uniform methodology in testing is important. A number of factors influence the energy requirements of the vehicle, besides such obvious ones as technical design, design of the vehicle and its work load, and the essential character of the traffic. In the course of simulated traffic tests with reproducible driving cycles, the progression in the driving speed is largely irregular. In the "Europa" cycle of city traffic conditions four distinct operating phases occur: steady-state phases in which driving speed is quasi-constant; acceleration phases when increase in kinetic energy causes an increased demand for performance; braking phases in which kinetic energy is reduced by power feedback to brakes or power plant; and static phases in which vehicle is stationary, power plant idling or even shut off. In these different operating phases the individual types of traction are to some extent highly divergent in their energy operating behavior.

by Manfred Rudolph  
Publ: ATZ Automobiltechnische Zeitschrift v80 n11 p531-5  
(1978)  
1978; 1ref  
Translated from German (original 3p; translation 7p).  
Availability: Reference copy only

HS-025 752

# ELECTRICAL OBSERVATION OF LUBRICANT FILM BETWEEN A CAM AND A LIFTER OF AN OHV [OVERHEAD VALVE] ENGINE

An electrical method to observe formation and breakdown of a lubricant film between a cam and a lifter of an overhead valve (OHV) engine has been developed. In this method, an electrical dc voltage is supplied between the surfaces, and the behavior of the lubricant film is observed through electrical voltage (conductivity) variation. Preliminary experiments were conducted in which a "cross-pin type" lubricant tester was used to examine the feasibility of the method for the study of lubrication phenomena. The method then was applied to the cam and lifter of the OHV engine to observe the effects of engine oil viscosity, the film-forming process during running-in and cold start, and the influence of pitting growth on film formation. Breakdown of the lubricant film increased with decreasing oil viscosity, increasing valve-spring load, and growth of pits on the lifter surface. A computer-aided data processing system was developed to determine the relationship between the cam angle and the average electrical voltage across the lubricant film.

by Kiyoshi Ninomiya; Masuhiko Kawamura; Kenji Fujita  
Toyota Central Res. and Devel. Labs., Inc., Nagoya, Japan  
Rept. No. SAE-780930; 1978; 12p 6refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

HS-025 753

# EVALUATION OF DISPERSANCY BY ANALYTICAL METHODS [ENGINE OILS]

By appropriate used-oil analysis it is possible to calculate indices such as Dispersion Efficiency (DE) and Dispersancy Index (DI) of an engine oil's performance which are largely independent of the type of engine used and test procedure followed. The DE represents the percent of insolubles suspended in the oil relative to the total insoluble products; the DI represents the percent of very fine insolubles out of the total oil insolubles. The DI, in particular, is and will be of great value in studying long-drain lubricants. One method of used-oil analysis is ASTM (American Society for Testing and Materials) D 893 which consists of two determinations of pentane insolubles, with and without the use of a coagulant (total sludge and precipitable sludge). This method has been used successfully for many years until the dispersant power of oils has been increased to such an extent that the coagulant becomes ineffective. An alternative method, membrane filtration, has been of value in recent years. The method consists of filtering a sample of oil diluted with pentane over membrane filters; the pore sizes selected are for obtaining the total sludge weight and the precipitable sludge. Major changes in additive technology have generated analytical difficulties (part of additives trapped by membrane, extremely small samples used with oils with many insolubles make repeatability too operator-dependent, and dilution with pentane of some lubricants induces formation of a precipitate which clogs the filter). However, a newly-developed photometric method seems promising in overcoming most present difficulties. This method, originally developed for analyzing used oils from Indirect Injection Diesel engines, consists of diluting a used-oil sample and making a reading of light absorption by means of a spec-



trophotometer. A comparison is made with the reading from an undiluted oil which has been centrifuged for an hour.

by F. L. Badiali; F. Berti; A. A. Cassiani Ingoni; G. Pusateri Assoreni, Petroleum Products Dept., Milan, Italy; Agip Petroli, Rome, Italy  
Rept. No. SAE-780932; 1978; 14p 5refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

## HS-025 754

### PROJECTIONS OF MOTOR VEHICLE FUEL DEMAND AND EMISSIONS

Methodologies were developed and applied to project motor vehicle fuel demand, air quality improvements through emission reductions, and the effect of stringent vehicle emission controls on energy consumption. Fuel consumption was compared between cars with catalyst and non-catalyst emission systems (catalyst systems require unleaded gasoline), and the effect of fuel quality on energy consumption was investigated. Motor gasoline demand for both the U.S. and Canada is projected to peak about 1980 at about 2% above the current level, followed by a gradual decrease through 1990. Total U.S. motor fuel use will increase through 1990 due to increasing diesel fuel demand. Ozone air quality projected from hydrocarbon (HC) and nitrogen oxides (NOx) emissions shows more improvement resulting from control of other sources than from further tightening of vehicle emission standards. Vehicle emission standards significantly more stringent than the 1975 Canadian level (25 g/mi carbon monoxide (CO), 2.0 g/mi HC, and 3.1 g/mi NOx) or certainly the 1977 U.S. levels (15 g/mi CO, 1.5 g/mi HC, and 2.0 g/mi NOx) increase energy consumption by as much as 20% at the 1981 U.S. level. Maintenance of the current emission standards in the U.S. could allow sufficient future improvements in gasoline consumption to cause total motor fuel use to decrease after 1982.

by Edward N. Cantwell, Jr.; Eugene N. Castellano, Jr.; John M. Pierrard  
E. I. du Pont de Nemours and Co. (Inc.), Petroleum Lab.  
Rept. No. SAE-780933; 1978; 52p 36refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

## HS-025 755

### URBAN TRAFFIC, FUEL ECONOMY AND EMISSIONS--CONSISTENCY OF VARIOUS MEASUREMENTS

A number of investigations are reviewed which were carried out by the Traffic Science Dept. of the General Motors Res. Labs. of the effect of traffic conditions on fuel consumption and emissions. A model based on driving vehicles in traffic is described in which the fuel consumption of a vehicle in urban traffic is expressed as a simple function of trip speed. Data from a variety of sources, including additional field data, detailed computer simulation, the same vehicle tested on different fixed urban driving schedules, and small segments of the Federal Test Procedure (FTP) are shown to fit the model. A similar model of hydrocarbon (HC) emissions as a simple function of trip speed is derived from analyzing small segments of FTP data. Data from published Environmental Protection Agency relations, detailed computer simulation, and

dynamometer replication of street data are shown to fit this model. No simple models have been found for carbon monoxide and nitrogen oxides. In general, it has been found that urban traffic, despite its seemingly disorganized appearance, yields rather consistent relations between fuel consumption and average speed, and between HC and average speed.

by Leonard Evans  
General Motors Res. Labs., Traffic Science Dept., Warren, Mich.  
Rept. No. SAE-780934; 1978; 14p 25refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

## HS-025 756

### THE EFFECTS OF TECHNOLOGY ON AUTOMOBILE FUEL ECONOMY UNDER CANADIAN CONDITIONS

As part of the Canadian Combustion Res. Lab.'s ongoing program to evaluate the performance of automobiles with advanced engine technology under Canadian climatic conditions, major results to date are reported for trials conducted by the Oakville Res. Centre of Shell Canada Ltd. to measure temperature effects on fuel economy under closely-controlled, cold-room chassis dynamometer conditions. It has been determined that fuel economy degrades significantly as ambient temperature decreases. Diesel, stratified-charge, lean-burn, and turbocharged, knock-limited engined automobiles show significantly less degradation in fuel economy and emissions than do conventionally-carbureted, catalyst-equipped vehicles. In particular, the new diesel cars offer large benefits in weight-normalized fuel economy and emissions for the wide temperature range found in Canada's climate.

by A. C. S. Hayden  
Energy, Mines and Resources Canada, Canadian Combustion Res. Lab.  
Rept. No. SAE-780935; 1978; 12p 5refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

## HS-025 757

### A COMPARATIVE ANALYSIS OF THE THERMAL EFFICIENCY OF 1977 AND 1978 MODEL YEAR VEHICLES UNDER CHASSIS DYNAMOMETER CONDITIONS

On the basis of thermal efficiency and engine load factor, a comparison is made of the performance of 1977 and 1978 model year vehicles submitted to the Environmental Protection Agency for emissions certification purposes. Projections are made of fuel savings which could have been achieved if all vehicles had been at or above the thermal efficiency regression line (median powertrain technology) or the plus one sigma line (better than average technology). It is shown that at any load factor, the spread in thermal efficiencies is in the order of 2 to 1. The calculated mean thermal efficiency for 1978 models on the Federal Test Procedure (10.8%) is lower than the comparable value for 1977 models (11.0%). Automatic transmissions impose a significant penalty on thermal efficiency of small vehicle-engine combinations (impact not determined for large vehicle-engine combinations). Mpg improvements have



been achieved through means other than improvement in powertrain thermal efficiency. If all vehicle manufacturers had utilized median powertrain technology or better, the projected fuel savings for the 1978 model year fleet would have been 245 million gallons in the first year and 1.36 billion gallons through ten years of operation. If vehicle manufacturers had utilized better than average technology in all vehicles, fuel requirements could have been reduced by approximately 12%. Expressed in gallons of fuel saved, this reduction represents one billion gallons in the first and over six billion gallons through ten years. These facts suggest that with existing technologies, vehicle manufacturers can improve fuel economy by better matching of engines (specific fuel consumption), transmissions, and final drive ratios to vehicle power requirements.

by F. Peter Hutchins; James M. Kranig  
Environmental Protection Agency  
Rept. No. SAE-780936; 1978; 14p 1ref  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

HS-025 758

#### **TFC/IW [TOTAL FUEL CONSUMPTION/INERTIA WEIGHT]**

The use of the TFC/IW (total fuel consumption divided by inertia (test) weight) concept in analyzing fuel economy data is discussed and illustrated using information from SAE (Society of Automotive Engineers) papers in the EPA (Environmental Protection Agency) fuel economy series on sales-weighted values of various fleets and subfleets, and EPA certification and fuel economy data on 1978 vehicles as of 3 Feb 1978. TFC/IW is a measure of drivetrain efficiency that requires no additional complicating assumptions; it is as applicable to a single test on a vehicle as it is to a fleet. CID (cu in displacement) vs. IW is explained. Using 1978 industry 50-states sales-weighted figures for passenger cars, plots of IW vs. TFC/IW are presented giving isometric fuel economy lines. Similar plots are shown for 1974 and 1978 sales-weighted car values, 1968 to 1978 sales-weighted car fleet values, 1978 car values by EPA class, 1978 49-states and California car values, and 1978 49-states and California truck values. Passenger car data are separated into diesel and gasoline subfleets. The effect of weight reduction on fuel economy, in terms of TFC/IW, is discussed. TFC/IW in 1985 is considered. Appended are 1978 EPA data, which are not sales-weighted, but sorted by engine and IW for each of the 4 major subfleets, 49 states and California, passenger car and truck. The mean, standard deviation, minimum and maximum values are given for the following parameters: urban fuel economy, highway fuel economy, total (combined) fuel economy, inertia weight, TFC/IW, CID, SAE hp rating of engine, dynamometer load hp, axle ratio, N/V and the urban values of hydrocarbon, carbon monoxide, and nitrogen oxides emissions.

by Doran K. Samples; Richard C. Wiquist  
Chrysler Corp.  
Rept. No. SAE-780937; 1978; 20p 7refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

HS-025 759

#### **A FUEL ECONOMY MEASUREMENT DILEMMA: CERTIFICATION TESTING VS. CUSTOMER DRIVING**

The EPA (Environmental Protection Agency) fuel economy measurement procedure and its relationship to customer driving, the problem of generating "representative" fuel economy labels, and the accuracy of fuel demand projections are discussed. Factors such as use of standard test conditions, the use of a chassis dynamometer, and the difficulty in quantifying such factors as road and environmental conditions and customer maintenance schedule contribute small biases which can cause the EPA composite fuel economy figures to differ from those found in average customer service. The main value of the test procedure is that it has provided a uniform test method for all manufacturers which produces vast amounts of comparative fuel economy data. Historically, small changes to the procedure to make it more "representative" have been made without any attempt to quantify their effects. Extensive engineering data should be acquired to justify any procedural changes, and if these changes affect the established baseline, the mandated fuel economy standards should be modified appropriately. The labeling of cars with a "representative" fuel economy value is certain to result in some customer misinformation and dissatisfaction. At best, current labeling methods can be expected to indicate real vehicle differences only when label values differ by more than 2 mi/gal (0.85 km/l). Furthermore, wide variations exist in customer fuel economy (ranging up to 15 mi/gal) for the same EPA label value. Changes in new car fuel economy have a significant impact upon future fuel demand projections. A stable fuel economy measurement procedure and an understanding of the factors which relate certification to average customer economy are needed to reduce the uncertainties in such projections.

by Craig Marks  
General Motors Corp.  
Rept. No. SAE-780938; 1978; 11p 10refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

HS-025 760

#### **ASTM [AMERICAN SOCIETY FOR TESTING AND MATERIALS] STUDY OF FLUIDITY OF AUTOMOTIVE GEAR OILS AT LOW TEMPERATURES**

A review is presented of the work of the ASTM (American Society for Testing and Materials) Res. and Devel. Div. VII during 1973-1977 related to the low-temperature flow characteristics of automotive gear oils. The first phase of the research program was designed to compare the operability, repeatability, and reproducibility of Federal Test Method 3456.1 and the Canadian Test Method 29.1b. The purpose of the second phase was to obtain full-scale axle performance data at low temperatures on a representative group of reference oils, and to evaluate the correlation of the oil performance in the full-scale axle with its performance in laboratory test methods. Results of Phase 1 showed that the former Canadian method was superior in discrimination and operability to the former U.S. test method. Some changes were recommended to the Canadian method (thermometry and other procedures), which have been adopted in the proposed Canadian Channel Point

Method 29.1C and in the current channel point procedure described in U.S. Military Specification MIL-L-2105C for automotive gear oils. In the second phase, the National Res. Council of Canada torque-to-break test, and the AutoResearch Labs., Inc., Chicago (ALI) time-to-lubricate test were used to study flow properties of gear lubricants at low temperatures in full-scale axles. Based on the test results, the ALI test is judged suitable for such measurements, and as such is a meaningful basis for comparing laboratory tests for their suitability. Three laboratory procedures (channel point, Brookfield viscosity, pour point) were investigated for their ability and usefulness in determining low-temperature flow characteristics of gear oils. The Brookfield viscosity test proved the most suitable, and is recommended as the only criterion needed. It is recommended that channel point be dropped as an evaluation of cold fluidity of gear oils.

by H. F. Hitchcox; D. L. Powell  
Exxon Res. and Engineering Co., Linden, N.J.; AutoResearch Labs., Inc., Chicago, Ill.  
Rept. No. SAE-780939; 1978; 43p 4refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

## HS-025 761

# FACTORS THAT INFLUENCE THE PRECISION OF BROOKFIELD VISCOMETRY OF AUTOMOTIVE LUBRICANT FLUIDS

A summary and analysis are made of data that have led to a proposed generalized Brookfield procedure for measuring the low temperature, low shear rate viscosity of automotive lubricant fluids. The data were collected between 1974 and 1977 by ASTM (American Society for Testing and Materials) Committee D-2, Res. and Devel. Div. VII, Brookfield Viscometry Task Force in cooperation with the Institute of Petroleum, the Groupement Francaise de Coordination, and the National Research Council of Canada. The sources of error in the generalized Brookfield procedure are examined in detail. A system based on the known viscosity-temperature function of Newtonian reference fluids is proposed for estimating error magnitudes from existing cooperative data. Application of these estimated error magnitudes to engine and gear oil data produced repeatability and reproducibility estimates that are functions of viscometer rpm for non-Newtonian products. Viscometer rpm is shown to be a critical test parameter at low temperature. RPM sensitivity is largely due to the Brookfield viscometer's ability to sense the strength of the wax or wax-additive gels that exist below the cloud point. The physical and rheologic reasons for this sensitivity are outlined. Major points of the proposed generalized method are: Application of Newtonian reference oils to monitor temperature control, calibration and general viscometer operation; tabulation of the acceptable viscosity range for each rpm; tabulation of precision as a function of rpm; tabulation of a range of acceptable sample cooling rates; reporting of viscometer rpm, along with apparent Brookfield viscosity; and description of the effect of low temperature gel on Brookfield viscosity. Extensive tables of data are included.

by J. F. Gyer  
Mobil Res. and Devel. Corp.  
Rept. No. SAE-780940; 1978; 31p 7refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
Availability: SAE

## HS-025 762

# ROAD SURFACE BULK WATER DRAINAGE--A THEORETICAL STUDY

A theoretical approach to bulk water drainage properties at the tire/road surface interface for a freely rotating tire is presented. The overall conclusion drawn from the theoretical study is that it is possible to optimize the road surface macrotexture conditions (aggregate size, aggregate spacing, and absolute texture depth) to give the minimum time for removal of bulk water from the interface yet give sufficient area of contact between the tire and road surface to obtain the maximum possible friction levels. The drainage theory also shows how the contact patch pressure distribution of a plain-treaded tire affects the bulk water drainage properties at the tire/road surface interface. The contact pressure distribution (high shoulder pressure or uniform contact patch pressure) does not appear to have any effect on the drainage properties for tires having a full tread pattern and operating under normal speed conditions, since the tread pattern also plays an important role in the removal of bulk water.

by R. Bond; G. Lees  
Publ: Tire Science and Technology v6 n2 p125-58 (May 1978)  
1978; 16refs  
Research supported by Dunlop Ltd.  
Availability: See publication

## HS-025 763

# DRUNK DRIVING PROBLEM GROWS WORSE

A new law became effective in Calif. 1 Jan 1979, by which bar owners and party hosts are no longer legally liable for highway accidents and deaths caused by adult drinking drivers to whom they served liquor. A 1971 ruling by the Calif. Supreme Court had allowed the legal liability of bars and restaurants for actions of customers to whom they served too much liquor, and in 1978 the Court extended the liability ruling to include private partygivers. In April, 1978, the Liquor Lobby sponsored a bill introduced by State Senator Ruben Ayala to relieve the bars and hosts of civil liability for drunk driving accidents. The bill was denounced as placing the financial interest of bar owners above the interests of innocent persons who may be killed or injured by drunken drivers. Its constitutionality, which seems to deny certain basic rights in seeking redress for wrongful death and injuries, is sure to be tested, probably before the Supreme Court. One provision, however, is countered by a new bill, (SB-1175) which provides stiffer criminal penalties for bartenders and others who serve liquor to obviously drunk persons, as well as liability for injuries caused by obviously intoxicated minors they have served. Dissatisfaction with the Ayala bill seems certain; the need is for laws that deter drunken driving, not encourage it. In many deadly crashes caused by intoxicated drivers the offenders were repeaters or habitual drunk drivers. One new law makes a drunk driving conviction cost \$25 more, the extra money to pay for blood tests. Several "diversion" programs are being tried, treating repeat offenders as alcoholics, with encouraging results; yet many of the repeaters continue to drive dangerously. A further problem revealed by blood testing is the use of marijuana. Research is continuing. Legal authorities believe that swiftness and certainty of punishment are always more effective in dealing with criminal behavior; judges in

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Calif. are criticized for being too lenient in sentencing persons convicted of felony drunk driving.

by William L. Roper

Publ: California Highway Patrolman v42 n12 p11, 38-9, 41-2, 46-7 (Feb 1979)  
1979

Availability: See publication

HS-025 764

#### **DRUGS AND HIGHWAY SAFETY: RESEARCH ISSUES AND INFORMATION NEEDS**

A study was conducted to assess present knowledge of how and to what extent drugs other than alcohol contribute to traffic crashes. An extensive review of the research literature showed that the problem has not been adequately defined. The review also indicated that much past research in the area has been less than fully reliable because of limited research designs and methodological weaknesses. The major problem areas are study of actual driving performance in the laboratory, analysis of the driving task, and experimental design. Methodological requirements and research priorities are discussed; the term "drug" is defined, factors in drug usage and drug effects and methods of epidemiological research are considered. Research programs recommended as having the highest priority are large-scale field studies designed to identify specific drugs most prevalent in accident-involved drivers. Effective countermeasures depend on assessment of such information.

by Kent D. Joscelyn; Alan C. Donelson

DOT-HS-4-00994

Publ: HSRI Research Review v9 n2 p2-17 Sep/Oct 1978  
1978; 70refs

Also supported by Motor Vehicle Manufacturers Assoc.

Earlier Version presented at 22nd Conference of the American Assoc. for Automotive Medicine.

Availability: See publication

HS-025 765

#### **LEGAL AND ADMINISTRATIVE ACTIONS TAKEN AGAINST AT-FAULT DRIVERS INVOLVED IN FATAL TRAFFIC CRASHES**

An exploratory study was made of legal and administrative actions taken against 2361 surviving drivers involved in fatal traffic accidents in Michigan in 1962. The objectives were to assess the capability of centrally maintained traffic record systems to provide data on legal and administrative actions taken against at-fault drivers; and to estimate the frequency with which at-fault drivers in fatal crashes were charged, adjudicated and sanctioned. In Michigan, for the year 1972, the central records systems could not provide the needed data, apparently because courts of record did not report the dispositions of traffic cases to the Michigan Dept. of State. Therefore the study was broadened to examine other record systems to address the second objective. The review of accident reports, centrally maintained criminal records, and locally maintained court records resulted in these estimates: one driver in four who was involved in a fatal crash could have been charged with a felony (manslaughter or negligent homicide); only one in twelve was actually charged with a felony; only one in twenty-four was convicted of a felony; and, of those convicted, only half had their convictions entered on their driving

records. Most drivers involved in fatal crashes were summoned for reexamination by the Dept. of State, the driver licensing authority in Michigan, and license revocations or suspensions were more frequent in cases of at-fault drivers. The two major problems, i.e. the low rate of felony charges and deficiencies in information transfers among record systems, should be explored to define the problems more precisely and to recommend specific actions needed. Such a study should include in-depth interviews with police officials, prosecutors, judges, court clerks, and DSP (Dept. of State Police) and DOS (Dept. of State) staff members concerned with improving central record systems.

by Paul A. Ruschmann

Publ: HSRI Research Review v9 n2 p18-23 (Sep/Oct 1978)  
1978; 1ref

Availability: See publication

HS-025 766

#### **MANIFOLD FUEL FILM EFFECTS IN AN SI [SPARK IGNITION] ENGINE**

A test program was conducted with a carbureted 2.3-liter engine in which a map of engine operating conditions promoting intake manifold wall films of appreciable magnitude was defined on the basis of visual observations. It was found that the largest maldistributions of fuel/air ratio among the four cylinders of the engine occurred during operation at conditions characterized by the presence of extensive fuel puddles on the intake manifold floor. It was also found that while the intake manifold fuel films and puddles could essentially be eliminated by heating the manifold floor, the fuel/air ratio distributions among cylinders under such conditions were virtually identical to those measured under conventional operating conditions. On the basis of these data, it was concluded that the steady-state distribution of fuel among the cylinders was not affected by the presence of liquid films or puddles within the intake manifold but rather that the resulting maldistributions were attributable to other charge stratification effects in the intake flow process. Performance mapping data are appended for fuel/air ratio and airflow distributions with conventionally-heated and steam-heated intake manifolds.

by I. W. Kay

United Technologies Corp., United Technologies Res. Center, East Hartford, Conn.

Rept. No. SAE-780944; 1978; 26p 5refs

Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.

Availability: SAE

HS-025 767

#### **ROLLOVER INJURIES OF THE UPPER EXTREMITY [OFF-ROAD VEHICLES]**

Eleven patients were treated from 1971 to 1976 for rollover injuries of the upper extremities resulting from the rollover accidents of off-road vehicles in rough terrain. Injuries to the volar surfaces of the extremity were most common, but injury to the extensor surfaces seemed to be more severe. Soft-tissue injuries predominated as did injury to the nondominant hand. The majority of patients returned to their original jobs after sometimes prolonged recovery and rehabilitation. The roll bar and roll cage are definitely a safety item in these vehicles; there were no head injuries in any of the patients. However,

severe upper extremity injury can occur in spite of or in conjunction with these safety items; a reduction in such injuries might be produced by constructing a hand hold on the inside of the rollover cage, and by advising that the extremities be kept within the rollover cage at all times when the vehicle is in motion.

by Curtis N. Harris; Virchel E. Wood  
 Publ: The Journal of Trauma v18 n8 p605-7 (Aug 1978)  
 1978; 1ref  
 Availability: See publication

HS-025 768

### ALCOHOL AND THE DRIVER

The properties of alcohol as a drug increasing the risk of motor-vehicle accidents should be recognized. Accident surveys show that the high risk driver is the regular drinker of large amounts of alcohol, with a previous conviction for drinking and driving, and not the ordinary driver who has inadvertently exceeded the statutory limit by a small amount. Countermeasures considered to be ineffective include the publicity campaign ("Don't drink and drive"), which does not register with a heavily drinking driver; random breath tests, which are inconvenient to motorists, not cost-effective in terms of police time, and detect very few drivers who have exceeded the limit; and lowering the statutory limit, which would have little effect on the heavy-drinking drivers who pose the chief threat, while threatening with prosecution and loss of license a large group of ordinary social drinkers. In addition, the number of hit-and-run accidents would increase if drivers knew they might be prosecuted after having taken only very small amounts of alcohol. Increasing the level of enforcement of the existing law on a selective basis is recommended instead: e.g., on roads where and at times when alcohol-related accidents are likely to occur. The reluctance of the courts to accept a situation where guilt depends almost exclusively on the results of a blood alcohol concentration test is understandable but not logical, and demoralizing to police officers attempting to enforce traffic laws. Public opinion should support stricter enforcement, and high-risk drivers convicted of the offence should not have their licenses returned to them automatically after a year, as at present, but should be required to show their driving is no longer a danger to other road users. Further research is needed in the distribution of blood alcohol concentrations in a representative sample of the driving population, possibly by voluntary road surveys using breath samples.

by J. D. J. Harvard  
 Publ: British Medical Journal v1 p1595-7 (17 Jun 1978)  
 1978; 2refs  
 Based on a paper read at the Government's National Road Safety Conference, London, 13-14 Jun 1978.  
 Availability: See publication

HS-025 769

### CORRELATES OF ALCOHOL ARRESTS IN A RURAL STATE [WYOMING]

Arrest and conviction rates for public intoxication, driving while intoxicated, and liquor law violations were correlated with population, population change, liquor sales, number of law officers, Indian population and overall crime rate for 23 counties in Wyoming. It was concluded that increased liquor sales, but not arrest rates, are associated with population in-

crease. Alcohol arrests are related positively to population magnitude and overall crime rate, but not to number of law officers. Counties with larger Indian populations report higher arrest rates for public intoxication and liquor law violations, but conviction rates for alcohol arrests in these counties are not different. Results suggest that the style or outcome of drinking might be of central importance for minority groups with high rates of arrest, such as Indians, since consumption rates do not differ. It would appear that treatment programs for such groups should concentrate on modifying the time, place, and social outcomes of drinking.

by Kenneth R. Olson; Roderick S. Carman; Richard A. Pasewark  
 Publ: International Journal of the Addictions v13 n3 p415-25 (1978)  
 1978; 15refs  
 Availability: See publication

HS-025 770

### PARAMETRIC SIMULATION OF SIGNIFICANT DESIGN AND OPERATING ALTERNATIVES AFFECTING THE FUEL ECONOMY AND EMISSIONS OF SPARK-IGNITED ENGINES

A fundamental thermodynamic model of the complete spark-ignited, homogeneous charge engine cycle has been used in several parametric analyses to predict the effects of engine design and operating alternatives on fuel consumption and emissions of nitrogen oxides (NOx) and unburned hydrocarbons (HC). The simulation includes sub-models for wall heat transfer, NOx and HC emissions, and the engine breathing processes. This work demonstrates the power and utility of a comprehensive engine simulation by presenting several independent parametric studies that were carried out in response to genuine engine design and/or operating strategy questions. Included in this compilation are the effects of cycle heat loss, exhaust port heat loss, combustion duration, and charge dilution (exhaust gas recirculation (EGR) and/or lean air-fuel ratio). The influence of the design variables associated with bore-stroke ratio, intake and exhaust valve lift, and cam timing are also considered. Actual engine data are shown to enhance and lend validity to the analytical results when appropriate.

by J. M. Novak; P. N. Blumberg  
 Ford Motor Co.  
 Rept. No. SAE-780943; 1978; 30p 20refs  
 Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978.  
 Availability: SAE

HS-025 771

### ASSESSMENT OF THE LOW TEMPERATURE BROOKFIELD VISCOSITY OF LUBRICANTS BY A NEW LIQUID BATH METHOD

The present methods available to measure the viscosity of fluids at low temperature with the Brookfield viscometer do not give entire satisfaction because of their low precision. A new "liquid bath" method is proposed for measuring the Brookfield viscosities; it offers several improvements over other "air bath" methods: shortened test duration, rate of cooling very near the one observed in service and well controlled, and better precision due to a good control of the regulation of the liquid bath and to the fact that the test cell tube is kept in

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the bath throughout the determination. The new method, approved by the Coordinating European Council as a tentative method numbered CEC L18-T76, is summarized in the appendix.

by Andre Vidal  
Compagnie Francaise de Raffinage, TOTAL TECHNIQUE,  
Centre de Recherches  
Rept. No. SAE-780941; 1978; 12p 1ref  
Technical Paper Series. Presented at International Fuels and  
Lubricants Meeting, Toronto, 13-16 Nov 1978  
Availability: SAE

HS-025 772

### ANTI-LOCK BRAKING

A report is given on the Institute of Electrical Engineers/Institution of Mechanical Engineers colloquium on antilock braking, held Nov 1978. A representative from the Dept. of Transportation (U.K.) spoke of the limitations of load-apportioning valves for controlling inter-axle brake distribution in the interests of braking stability leading to the introduction of antiskid systems in the mid-1960's. Mention was made of the imminent publication of Economic Commission for Europe Annex 13 on test requirements for antilock braking systems (annex to United Nations Regulation 13/E/ECE/324; E/ECE/TRANS/505). A Girling representative discussed some of the confusion surrounding the apparently premature introduction of U.S. Federal Motor Vehicle Safety Standard 121 covering general requirements for air-braked vehicles and including specific requirements for preventing wheel lockup. A discussion by a representative of Mullard pointed to the four main areas affecting the reliability of electronics: temperature, vibration, atmosphere, and electrical (mainly electromagnetic) interference. A National Freight Corporation representative explained that the Transport and Road Res. Lab. (TRRL, U.K.) evaluation of in-service antilock systems had taken place within his fleet of 21,000 articulated vehicles. A Dunlop representative explained that articulated vehicle antilock installations began in 1968 and that today there are about 6000 tractors, around 600 semitrailer axles, and a growing number of rigid vehicles in service in the U.K. with antilock systems. The U.S. experience with antilock requirements was further discussed. It was explained that antilock braking has been legally mandatory on all air-braked trucks since 1975. A TRRL representative discussed the effects of weight transfer on the adhesion of motorcycles. A description of the Bosch ABS antiskid system for cars, a modular design, was given by a company representative.

Publ: Automotive Engineer v4 n1 p43-8 (Feb-Mar 1979)  
1979; 1ref  
Availability: See publication

HS-025 773

### HANDBOOK OF HIGHWAY SAFETY DESIGN AND OPERATING PRACTICES. REV. ED.

This revised and expanded version of the 1973 Handbook presents information and guidelines for highway authorities at the state, city, and local levels who are involved in highway design and operation. It is intended as an educational tool and reference guide. Chapters cover cross sections and slopes, bridge design, signing, highway traffic barriers, small drainage structures, railroad grade crossings, gores, lighting, skid

prevention, construction and maintenance operations, and special design considerations. The construction and maintenance operations chapter is a new addition, and the special design considerations chapter has been expanded from the 1973 edition. An added introductory chapter provides the reader with information which puts specific safety concerns in perspective with all others as candidates for funding from a limited budget. A list of references is included at the end of each chapter. Photographs and illustrations accompany the text.

Federal Hwy. Administration, Washington, D.C. 20590  
1978; 127p refs  
Availability: GPO

HS-025 774

### SAFETY FEATURES OF STOP SIGNS AT RAIL-HIGHWAY GRADE CROSSINGS. VOL. 1. EXECUTIVE SUMMARY FINAL REPORT.

by James H. Sanders; Hugh W. McGee; Chang S. Yoo  
BioTechnology, Inc., 3027 Rosemary Lane, Falls Church, Va. 22042  
DOT-FH-11-9192  
Rept. No. FHWA-RD-78-40; 1978; 23p 1ref  
Rept. for Oct 1976-Apr 1978. For abstract, see HS-025 775.  
Availability: NTIS

HS-025 775

### SAFETY FEATURES OF STOP SIGNS AT RAIL-HIGHWAY GRADE CROSSINGS. VOL. 2. TECHNICAL REPORT. FINAL REPORT

A study was undertaken to determine the advantages and disadvantages of selective use of highway stop signs as safety improvements at rail-highway grade crossings and to develop guidelines for their appropriate use or non-use. Literature and inventory surveys were performed to compare accidents for crossings with crossbucks only to those for crossings with crossbucks and standard highway stop signs. Field studies were performed to compare driver behaviors for crossbuck-only crossings and for crossbuck/stop sign crossings. Driver behavior investigations included speed profiles, looking behavior, and observance of stop signs. Results indicate that stop signs are used more frequently in urban areas, and that crossings having stop signs tend to have higher train volumes. Accident rates for stop sign crossings are lower than rates for crossbuck-only crossings for higher vehicle-train exposure values. Stop signs, when properly used, result in improved driver behaviors adequate for the detection and avoidance of trains. It is suggested that stop signs be applied selectively only at hazardous passive grade crossings and not be used indiscriminately at all passive grade crossings. Requirements for effective use of stop signs at grade crossings are as follows: installation to be believable, (i.e. be valid to the driver), vehicle-train exposure value not to exceed 100 (i.e. train value higher than average, average annual daily traffic value lower than average), inability of driver to detect trains adequately unless he nearly stops, level of enforcement at least equal to that applied to intersection stop signs, selective use of stop sign to reinforce expectancy, high level of traffic engineering to avoid hazardous traffic conflicts, treatment of stop sign installation as a system (including proper deployment and main-

tenance of advance warning for both grade crossing and stop sign), and periodic review of crossing.

by James H. Sanders; Hugh W. McGee; Chang S. Yoo  
BioTechnology, Inc., 3027 Rosemary Lane, Falls Church, Va.  
22042

DOT-FH-11-9192

Rept. No. FHWA-RD-78-41; 1978; 171p 41refs

Rept. for Oct 1976-Mar 1978. For summary report, see HS-025 774.

Availability: NTIS

HS-025 776

### **SOFTENING THE BLOW. CAN A TRUE EXPERIMENTAL SAFETY VEHICLE BE MADE PRACTICAL?**

Under sponsorship of the National Hwy. Traffic Safety Administration, Minicars Inc. (Goleta, Calif) has developed a small, practical experimental safety vehicle, Eagle II, which not only meets all the Federal targets on exhaust emissions, fuel economy, and safety to the 1985 standards, but also could be put into production at a cost very similar to that of the VW Rabbit, Ford Pinto, or Toyota Corolla. Among the mass production problems are those of cleanly welding very thin steel sheet main body panels into the closed box sections and the sensitive procedure involved in injecting foam into these panels to ensure perfect filling. Minicars have turned to Japan and Italy for major components (engine/transmission package from Honda Civic, front and rear suspension of the Fiat X1/9). The weight of the Eagle II is around 2190 lb. The foam-filled gull-wing door panels, front wheel arches, and hood are mounted on a steel platform/backbone chassis. The front and rear ends are made from an impact-absorbing skinned plastic (not damaged in 10-mph front and 5-mph rear impacts). The bumpers can withstand 40-mph head-on crashes without the main structure of the car being affected, and afford a good deal of pedestrian protection. Front/rear sections can be quickly and easily replaced, cutting repair costs. Much of the car's overall strength comes from double-roll protection bars which form the frames to the front and rear screens. Air bags are installed. The fuel tank, located in the center back bone, is afforded protection from all sides. Run-flat tires on alloy wheels are specified. More advanced equipment includes anticollision radar, and alphanumeric instrument displays. On a part-by-part basis, Eagle II could be put into production at a cost of \$3446 at an annual volume of 300,000.

by Martin Lewis

Publ: Autocar v150 n4293 p52 (17 Feb 1979)  
1979

Additional page of photographs.

Availability: See publication

HS-025 777

### **TRAUMATIC NEUROSIS [FOLLOWING A MOTOR VEHICLE CRASH]**

A new kind of injury, recently recognized as part of the post-traumatic clinical state following a motor vehicle crash, is referred to as psychic disability following trauma. Four types of post-traumatic psychiatric symptom complexes have been described: the conversion reaction, the phobic reaction, the tensive reaction, and "traumatic neurosis" itself. The traumatic neurosis can be contemplated as a specific psychiatric entity

characterized by such symptoms as the startle reaction, fear, loud noises, irritability, insomnia, tremulousness, anxiety, impairment of concentration and memory, frequent nightmares, significant decrease in social awareness, social contact, and sexual activity, and often profound depression. The traumatic neurosis can result from a great dissimilarity in the precipitating incidents, and may be a fundamental, organismic reaction to severe external stress. Most people who are subject to injury with no (or only a few seconds) preparation will suffer a high degree of fright. It is understandable that the dramatic quality of the accident, together with the intensity of the emotional reaction to it, encourages the sufferer to assume that other difficulties in his life subsequent to the accident are the result of the accident. Adversary roles are accentuated in cases such as these. Physicians are urged to get patients into therapy as soon after the accident as possible, as this is likely to lessen the emotional, as well as the financial, damage.

by Dorothy Rasinski Gregory

Publ: American Association for Automotive Medicine  
Quarterly/Journal v1 n1 p21-3 (Jan 1979)

1979; 5refs

Availability: See publication

HS-025 778

### **AUTOMOTIVE PROPULSION SYSTEMS PILOT STUDY. FINAL REPORT**

The essential elements and characteristics of the automotive industry are reviewed, with emphasis on the fundamental multinational importance of highway vehicles to the industry of countries of the world. Both the evolution of requirements placed on the industry and the changes in emphasis over the years 1970-1977 are discussed as a background for the subsequent summary of the technical content of the four international symposia held in 1973, 1974, 1975, and 1977 (in accordance with 1972 Memorandum of Understanding (MOU) signed by auto-producing NATO countries) on low pollution power systems/automotive propulsion systems. The apparent trends and directions of development observed from the meetings are identified. Resolutions are made regarding international programs for automotive energy research and development; recommendations are made for future international exchange of information and implementation of research and development activities on automotive propulsion systems. The adoption and implementation of these resolutions and recommendations will insure that the member countries of the North Atlantic Treaty Organization have recognized the need to deal with the pollution problem in a systematic and dynamic fashion. The following areas are recommended for initial exploration of specific international cooperative projects: power systems and components, high-temperature materials, alternative fuels, electric and hybrid vehicle systems, and harmonization or correlation of emission standards and procedures. Appended are the texts of the MOU and its 1973 Annex (establishing mechanisms for information exchange), a list of national representatives for each symposium, a list of organizations participating in the symposia, and descriptive

formation on key organizations involved in principal areas of technical activity involving automotive propulsion systems.

by A. C. Gullon; Claude Lamure; Jurgen Bandel; Renzo Strampelli; Johan G. Kuiperbak; H. G. Dormer; George M. Thur  
NATO/CCMS Automotive Propulsion Systems Pilot Study Working Group  
Rept. No. CCMS-76; 1977?; 114p 4refs  
Prepared for the Com. on the Challenges of Modern Society, North Atlantic Treaty Org. Title also in French. See HS-023 609 and HS-023 072 for related reports Vol. 1 and Vol. 2.  
Availability: GPO, stock no. 061-000-00225-1

HS-025 779

**THE EFFECTS OF WRITTEN LICENSING TESTS STRESSING KNOWLEDGE OF SAFE DRIVING PRINCIPLES FOR INTERMEDIATE RECORD RENEWAL APPLICANTS. AN EVALUATION OF THE INTERMEDIATE DRIVER COMPONENT OF CALIFORNIA'S SELECTIVE TESTING PROGRAM**

Drivers applying to renew their California driver's licenses are normally administered written tests to assess their knowledge of the California Vehicle Code. An experiment was conducted which utilized new tests, somewhat longer than the standard Dept. of Motor Vehicles (DMV) tests, which stressed knowledge of safe driving principles not included in the vehicle code. The primary purpose of the experiment was to determine the comparative effects of the test on a subject's subsequent driving record. The new tests were administered to renewal applicants who had moderate numbers of collisions and convictions on record, with a control group of comparable drivers receiving standard DMV law tests. The data for the 12-month period following written knowledge testing revealed no statistically significant differences between experimental or control group driving record means, indicating the administration of written tests on safe driving procedures did not result in a significant reduction in collisions or convictions. Correlation of test scores with driving record variables were similar in magnitude for both the DMV and safe driving test series, and indicated a slight tendency for drivers marking fewer wrong answers on either test series to have fewer collisions and convictions before and after testing than drivers who made more errors. Because no identifiable safety benefits appear likely from adopting the expanded safe-driving forms and additional costs would be incurred, it is recommended that this component of the selective testing program for driver's license applicants not be implemented.

by David W. Carpenter  
California Dept. of Motor Vehicles, Res. and Devel. Section, Sacramento, Calif.  
Rept. No. CAL-DMV-RSS-78-63; 1978; 27p 10refs  
Availability: Corporate author

HS-025 780

**RISK EXPOSURES. STRUCTURING OF THE NEED FOR RISK EXPOSURE DATA FOR TRAFFIC ACCIDENT ANALYSIS**

Risk exposure are discussed as traffic indices that show strong correlation with traffic accidents. By relating the number of accidents defined in time and space to the vehicle mileage for the corresponding temporal and spatial units, a risk factor or

accident rate is obtained. The vehicle mileage is an example of a risk exposure. Methods of determining risk exposures are outlined and include collection of data (by surveys) on individual trips with respect to journey type, method of travel and length of trip for a given period; recording of the presence of vehicles in time and space with the aid of traffic calculations at various points on the road network; traffic simulation; and recording techniques (e.g. observers, film or videotape). Calculations of simple risk exposures, risk exposures on link roads, and risk exposures at intersections are explained. The suitability of intersections for traffic studies of risk exposures is mentioned. An example is given of how different risk factors can be broken down into ratios between different traffic indices so that they can be better used as a basis for making decisions concerning measures to be taken in the road traffic system for link roads and intersections.

by Goran Nilsson  
Statens vag- och trafikinstitut (VTI), Fack, 58101 Linköping, Sweden  
Rept. No. VTI-144-A; 1978; 41p 2refs  
Swedish National Road and Traffic Res. Inst.  
Availability: Corporate author

HS-025 781

**THE INCIDENCE OF VEHICLE MISFUELING IN MAJOR CITIES IN CANADA**

Results are presented for a gas station survey in seven major Canadian cities (Halifax, Montreal, Ottawa, Toronto, Regina, Calgary, and Vancouver) during 1-21 Mar 1978 which attempted to estimate the incidence of the misfueling of vehicles. Misfueling was defined as the use of leaded gasoline in cars designed to use unleaded gasoline. The data were collected by on-site observers. In addition to fuel type used, information is compiled on the frequency of pump-nozzle substitution and fuel inlet tampering. A third misfueling method is that of fueling slowly without modification. It was found that a significant and growing rate of misfueling existed in all cities except Toronto and to a lesser extent Montreal. The misfueling rate is vehicle age-related and increases after the vehicle warranty period has passed. The principal method of misfueling is inlet tampering. The full-service stations have a much higher rate of misfueling than self-serve stations. The size of the price differential does not correlate well with the misfueling rate. Although the overall incidence of nozzle substitution is moderate, it is very high in certain areas, and it is usually higher at full-serve than at self-service stations. Currently, the misfueling problem is in its infancy, but data on older vehicles indicate that between 20% and 40% misfueling will be the minimum in the years to come. It is also considered possible that as these unleaded vehicles are transferred gradually to the used car market, the misfueling rate will increase even more. Misfueling thus presents a severe problem to the present automotive emission control program.

by G. W. Taylor  
N. D. Lea and Associates Ltd.  
Rept. No. SAE-780947; 1978; 8p 2refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov 1978. Survey sponsored by Canadian Dept. of Fisheries and the Environment.  
Availability: SAE



HS-025 782

# **THE EFFECT OF FUEL INJECTION ON NOX [NITROGEN OXIDES] EMISSIONS AND UNDESIRABLE COMBUSTION FOR HYDROGEN-FUELED PISTON ENGINES**

Direct cylinder injection for hydrogen-fueled piston engines was studied experimentally with an American Society for Testing and Materials/Cooperative Fuel Res. engine. An injection scheme was devised for which the combustion occurs during the period of hydrogen injection so that little unburned hydrogen accumulates in the cylinder. This scheme, called LIRIAM (late injection, rapid ignition and mixing) should preclude flashback and pre-ignition, and lowers the rate of cylinder pressure rise to acceptable levels. The potential of hydrogen as a low pollution fuel was investigated by comparing the NOx (nitrogen oxides) emissions from the same engine operated on hydrogen and hydrocarbon fuel. NOx emissions for hydrogen were very low provided the equivalence ratio was less than 0.5, and provided the hydrogen and air were well mixed. For equivalence ratios greater than 0.5, NOx emissions for hydrogen fuel were higher than for hydrocarbon fuel. With hydrogen injection, indicated mean effective pressure was varied between 0.07 MPa and 0.78 MPa without intake air throttling. Indicated efficiencies higher than 40% were achieved for part-load equivalence ratios, near 0.3. The timing of hydrogen injection had a significant effect on NOx emissions (decrease in NOx as injection is retarded). Appendices provide a review of experiments with hydrogen-fueled engines performed by previous investigators, with emphasis on undesirable combustion, and a description of methods used to calculate indicated thermal efficiency from data presented by previous investigators.

by H. S. Homan; P. C. T. DeBoer; W. J. McLean  
Cornell Univ., Ithaca, N.Y.  
Rept. No. SAE-780945; 1978; 20p 42refs  
Technical Paper Series. Presented at International Fuels and Lubricants Meeting, Toronto, 13-16 Nov. 1978.  
Availability: SAE

HS-025 783

# **VISIBILITY DURING NIGHT DRIVING ON UNLIGHTED ROADS**

The visibility level necessary for the performance of a visual task is defined relative to the visibility reference function. This function gives the threshold contrast required for visibility (at 50% detection accuracy) of a 4' reference task, exposed for 0.2s, as a function of background luminance. The visibility reference function, as presently proposed by the International Commission on Illumination (CIE), is to be considered illustrative only at background luminances below 1 cd/sq m. It may therefore not be representative of actual threshold values for visual tasks performed in this luminance region. Driving at night on unlighted roads with dipped-beam headlights is an example of such a task. It is shown that experimental data for this case (reference to European lights with ordinary incandescent lamps) indicate lower threshold values than those given by the visibility reference function.

by B. Hisdal  
Publ: Lighting Research and Technology v9 n3 p151-3 (1977)  
1977; 10refs  
Availability: See publication

HS-025 784

# **LIFE AND LUMINOUS FLUX OF HALOGEN INCANDESCENT LAMPS RELATED TO FILAMENT TEMPERATURE, PRESSURE AND CH2BR2 [METHYLENE BROMIDE] CONTENT**

An experimental study was made of 20 V, 100 W halogen incandescent lamps using different filling pressures for the halogen additive (0.25 torr CH2Br2 (methylene bromide) to 16 torr CH2Br2) and the inert gas krypton (4 atm to 16 atm), and burning at two voltages (20.0 V and 23.0 V). The maximum luminous flux and life were found for lamps with halogen filling pressures in the range of 1 torr CH2Br2 to 4 torr CH2Br2. It was found that lamps with low halogen filling pressures blacken. At high pressures, attack on the cold coil ends determines life. The blackening or nonblackening of the lamps is in agreement with the transport criterion derived from the solubility of tungsten in the gaseous phase. Halogen lamps with properly operating transport cycles fail due to a local temperature increase leading to burning-through of the filament. The experimentally found relationship among life, filament temperature, and filling pressure agrees approximately with the theory of the radial transport of tungsten in these halogen lamps. A simple correlation was found between the time at which the first hot turn is perceived and the life of the lamp. This agrees with the theory for the development of a hot spot in a wire.

by J. R. De Bie; J. C. M. A. Ponsioen  
Publ: Lighting Research and Technology v9 n3 p141-50 (1977)  
1977; 30refs  
Availability: See publication

HS-025 785

# **EXTENSIVE SUMMARIES OF PAPERS TO BE PRESENTED AT THE 5TH VSD [VEHICLE SYSTEM DYNAMICS]-2ND IUTAM [INTERNATIONAL UNION OF THEORETICAL AND APPLIED MECHANICS] SYMPOSIUM ON DYNAMICS OF VEHICLES ON ROADS AND TRACKS, VIENNA, SEPTEMBER 19-23, 1977**

A special journal issue contains extensive summaries of 43 papers to be presented at an international symposium whose theme is the dynamics of vehicles and vehicle systems on roads and tracks. Particular attention has been given to those problems where the contact or guiding forces acting between road or guiding system are of primary importance. The dynamical aspects of vehicles ranging from bicycles to magnetically levitated trains are covered. Representative topics include front wheel vibrations; steady state and transient vehicle performance; computing and measurement of the handling qualities of the belted tire; automated guideway transit vehicles; automatic lateral control of vehicles; the influence of vehicle control dynamics on driver-vehicle performance; and motorcycle dynamics and rider control.

by Hans B. Pacejka, ed.  
Publ: Vehicle System Dynamics v6 n2-3 p41-216 (Sep 1977)  
1977; refs  
See also HS-025 786.  
Availability: See publication



HS-025 786

**STATE-OF-THE-ART ARTICLES OF THE 5TH VSD  
[VEHICLE SYSTEM DYNAMICS]-2ND IUTAM  
[INTERNATIONAL UNION OF THEORETICAL AND  
APPLIED MECHANICS] SYMPOSIUM**

Four state-of-the-art articles on vehicle dynamics are presented which were prepared in response to an invitation by the Scientific Committee of the 5th Vehicle System Dynamics-2nd International Union of Theoretical and Applied Mechanics Symposium on dynamics of vehicles on roads and tracks, held in Vienna, 19-23 Sep 1977. The articles (not for oral presentation at the Symposium) cover the following topics: handling characteristics of car-trailer systems, sensitivity of driver-vehicle performance to vehicle characteristics revealed in open-loop tests, adaptation of a general multibody dynamical formalism to dynamic simulation of terrestrial vehicles, and bilateral model of manual steering system.

by Hans B. Pacejka, ed.

Publ: Vehicle System Dynamics v6 n4 p217-308 (Oct 1977)

1977; refs

Includes HS-023 818, HS-023 819, HS-025 789, and HS-025 790. See also HS-025 785.

Availability: See publication

HS-025 789

**ADAPTATION OF A GENERAL MULTIBODY  
DYNAMICAL FORMALISM TO DYNAMIC  
SIMULATION OF TERRESTRIAL VEHICLES**

The development of general Eulerian dynamic formalisms for the digital simulation of multibody systems is reviewed. Digital dynamic simulation on a large scale seems to have been relatively limited for terrestrial vehicles, in contrast to the development of that for extraterrestrial vehicles. Two kinds of dynamic systems programs are generally available. One is the canned "general system" program, the software for which is available for nearly any large-scale computer. The other is the "general multibody" program, some varieties of which have recently become available almost exclusively for aerospace applications. The first type of system necessitates initial derivation by the user of a suitable set of dynamical equations for a specific system, to be implemented by the computer program. Since the multibody type system is based specifically on more general dynamical formalisms, the user need only tell the computer how the system is hooked together, as well as some particulars about rotational and translational modes in the joints between bodies. In addition to the review of the current status of multibody formalisms, the formalism of Roberson/Wittenburg is generalized to systems whose configuration includes closed loops, thereby adapting it to the dynamic simulation of terrestrial vehicles.

by Robert E. Roberson

Publ: HS-025 786, Vehicle System Dynamics v6 n4 p279-95

(Oct 1977)

1977; 25refs

Availability: See publication

HS-025 790

**BILATERAL MODEL OF MANUEL [SIC] STEERING  
SYSTEM**

The bilateral model of the vehicle manual steering system is constructed in the matrix form of two variables, displacement and torque, simultaneously describing the dynamic relations between the variables of both sides of the steering wheel and tires. The frequency characteristics of the variables are measured by the bench test, and the transfer parameters of the model, given in the form of transfer functions, are obtained through the identification technique based on experimental data of frequency response. Comparison of the bilateral model derived using equations of motion of manual steering vs. the model derived using the identification technique clarifies the usefulness of the latter in the dynamic simulation of the steering system. Good agreement between dynamic responses obtained using the identified bilateral model and those obtained in vehicle field tests validate the model.

by Sado Iwamoto; Kaneo Hiramatsu; Shigeru Inoue

Publ: HS-025 786, Vehicle System Dynamics v6 n4 p297-308

(Oct 1977)

1977; 17refs

Availability: See publication

HS-025 791

**THE INFLUENCE OF THE TIME DURATION OF  
YELLOW TRAFFIC SIGNALS ON DRIVER  
RESPONSE**

Driver response to the onset of the yellow phase of traffic signals was observed at two suburban arterial intersections by means of time-lapse photography. In each lane, the last vehicles to cross the intersection after the onset of the yellow phase in green-yellow-red signal cycles were identified. The percentages of these last-to-cross vehicles that did not clear the intersection prior to red onset were determined for two settings of yellow-phase duration in peak and off-peak traffic on both wet and dry pavements. Under all conditions, these percentages were found to be substantially lower when the duration of yellow was longer than when it was shorter. It is concluded that the number of times vehicles fail to clear the intersection prior to red onset can be controlled by adjusting the duration of the yellow phase. Potential conflicts at signalized intersections were found to occur more frequently during peak traffic and on dry pavement. It is therefore concluded that conflicts are dependent not only on intersection geometry and travel speed, but on traffic density and pavement condition.

by William A. Stimpson; Paul L. Zador; Philip J. Tarnoff

Alan M. Voorhees and Associates, Inc.; Insurance Inst. for

Hwy. Safety

1979; 26p 11refs

Availability: Corporate author

HS-025 792

**DRIVER ED ATTACK BACKFIRES ON INSURANCE  
GROUP**

Major conclusions of an Insurance Inst. for Hwy. Safety (IIHS) study "Driver Education and Fatal Crash Involvement of Teenaged Drivers," along with a statement issued by IIHS subsequent to the announcement, are provided, as well as

comments of non-IIHS researchers who have reviewed the study and found it invalid. The IIHS study concluded that at least 2000 fatal crashes per year result from increased licensure of 16- and 17-year-olds because of driver education, and that raising the age of licensure to age 18 or eliminating driver education, separately or in combination, would prevent these fatal crashes. Researchers from the Pennsylvania Dept. of Education, Div. of Res.; the Florida State Univ. Traffic Safety Education Evaluation Proj.; the National Hwy. Traffic Safety Administration; and the Transportation Res. Board, Driver Education Com. all have expressed opposition, in one form or another, to the IIHS study. Subsequent to the Nov 1977 announcement of the study, IIHS, in Dec 1977, stated that its study made no finding that driver education be abolished nor did it suggest that driver education is not needed as a way of teaching young people to drive.

by William D. Cushman

Publ: Journal of Traffic Safety Education v25 n3 p7-8 (Apr 1978)

1978; 9refs

See also HS-022 375.

Availability: See publication

HS-025 793

#### UPDATE: MOTORCYCLE ACCIDENTS IN 1977

Statistical information on U.S. motorcycle accidents during 1977 covers motorcycle population, fatalities, mileage death rate, injury severity, types of accidents, directional analysis of accidents, contributing circumstances, time and day of week and month, road and weather conditions, operator characteristics (age, sex, residence), experience of operators, and part of body injured. Speeding was the most frequent cause of fatal accidents according to selected state studies, which also indicate that many motorcycle accident victims were not regular motorcycle operators or passengers or had mishaps early in their cycling experience. Based on their percentage of the total vehicles registered in 1977, motorcycles had fewer than their share of all accidents, but had more than their share of fatal accidents. Deaths of motorcycle operators and passengers totaled 3870 in 1977, representing a 29% increase over 1976. It has been suggested by some authorities that varying enforcement of helmet laws, changes in the laws, and lack of helmet legislation have had an adverse effect. A Univ. of Kansas study is cited that found that following repeal of that state's helmet law, head trauma was the cause of death in 93% of fatalities of motorcyclists not wearing helmets and 33% of fatalities where helmets were worn, traumatic head injuries rose 70% in cities studied, and head injuries were 56% more serious for nonhelmeted cyclists. Use of off-road vehicles (minibikes, go-carts, and motorcycles) by unlicensed and untrained drivers is considered a contributing factor in increased motorcycle injuries. The current status of motorcycle legislation (special license, helmets, inspection, headlight, eye protection) is tabulated by state. The importance of motorcycle instruction, proper licensing, and insurance coverage is emphasized. The availability of the National Safety Council's Defensive Driving Course Motorcycle Supplement is mentioned.

by Barbara Carraro

Publ: Traffic Safety v79 n2 p8-11, 29-32 (Feb 1979)

1979; 2refs

Availability: See publication

HS-025 794

#### WISE WALKERS IN THE MILE-HIGH CITY [DENVER PEDESTRIAN SAFETY PROGRAM]

In response to an alarming increase in Denver's pedestrian fatalities, the Denver Police Dept., in cooperation with the Colorado Div. of Hwy. Safety, undertook development of a Comprehensive Pedestrian Safety Prog. for the City and County of Denver, assisted by Applied Science Associates, a firm with extensive experience in pedestrian safety research. The first of three major phases of the project, begun in Oct 1976, involved a thorough analysis of more than 2500 pedestrian accidents that had occurred in Denver during 1972-1976. The second phase of the project involved countermeasure development and implementation. Four major approaches are currently being employed: a massive public information campaign, traffic engineering modifications at selected locations, selective enforcement of existing pedestrian and driver ordinances at high-risk locations, and educational programs aimed at such high-risk groups as children aged 5-9 and the elderly. As part of the education effort, a program from kindergarten to 3rd grade to teach children to Stop-Search-Detect at both intersections and midblock locations was designed, pilot-tested, and will be fully implemented in the Denver Public Schools in 1979. The third phase of the project, begun in Oct 1978, involves maintenance, updating, and refinement of Denver's Comprehensive Pedestrian Safety Prog. An evaluation of the program will be conducted after one year of operation.

by Robert L. Luby; Richard M. Thackray, Jr.; Jesse Blatt

Publ: Traffic Safety v79 n2 p18-20, 28-9 (Feb 1979)

1979

Availability: See publication

HS-025 795

#### RX: DRUGS AND DRIVING

The positions of the patient, the physician, and the drug manufacturer are discussed in relation to the law on driving while under the influence of drugs. There would appear to be a responsibility on doctors to advise patients concerning driving while taking such drugs as psychotropic drugs, hypnotics (especially barbiturates), antihistamines, amphetamines, and antidepressants, including a warning about mixing other drugs with alcohol. The problem exists, however, of obtaining information regarding acceptable doses in terms of driving safety. It may be that verbal warnings are insufficient and that containers should be labeled with warning notices. This would certainly apply to proprietary over-the-counter medicines. This places an obligation on drug manufacturers to test drugs for their effect on driving. Such tests are generally limited to normal volunteers in single-dose studies. Little is known about the effects of most commonly-used drugs when administered to diseased subjects who drive when there is likely to be a disease-drug interaction. Manufacturers must test their drugs in the driving situation and make appropriate recommendations; doctors who prescribe must advise their patients about drugs and driving; if a drug has been tested and cautionary advice given, the patient who drives regardless ought to be punished in the same way as the driver who drinks.

by George Beaumont

Publ: Traffic Safety v79 n2 p14-5 (Feb 1979)

1979

Reprinted from Medical Tribune (15 Jul 1978). Adapted from an article by Dr. Beaumont in Medical News-Tribune.

Availability: See publication

HS-025 796

**CRASH THEORIES AND THEIR IMPLICATIONS FOR RESEARCH**

Five underlying theories about the nature of the crash phenomenon are presented, and their implications for crash research discussed. The single event theory is based on the assumption that an accident consists of a single event that has a cause. The chain-of-events theory follows the premise that if a set of "unsafe conditions" set up a row of vulnerable dominos, an "unsafe act" would start them toppling. The determinant variable theory assumes that some common factors are present in accidents, and that they can be discerned from the right accident data. The branched events chain theory is based on the perception that events can flow in a chain-like sequence from a variety of origins in a system toward an accident event. The multilinear events sequences theory views the accident phenomenon as the transformation process by which a homeostatic activity is interrupted with accompanying unintended harm. The implications of these theories for accident researchers are discussed in terms of investigative, data, and methodology traps. Increased awareness of crash theories by accident researchers and investigators and increased dialogue between the two groups are advocated.

by Ludwig Benner, Jr.  
National Transportation Safety Board, Hazardous Materials  
Div., Washington, D.C.  
Publ: American Association for Automotive Medicine  
Quarterly/Journal v1 n1 p24-7 (Jan 1979)  
1979; 14refs  
Availability: See publication

HS-025 797

**WORLD MOTOR VEHICLE DATA. 1978 ED.**

This statistical compilation of international motor vehicle data through 1977 includes production totals by manufacturer as well as by country. The data were supplied by foreign government agencies, trade associations, private services, and the press. World data on production/assemblies, exports, and registrations are tabulated. Tables provide applicable data on assemblies/production, exports, imports, and registrations/sales for the following countries and geographical areas: Africa (Morocco, South Africa, Africa), Asia (India, Japan, Korea), Western Europe (France, West Germany, Italy, Sweden, U.K., Belgium, Ireland, The Netherlands, Nordic countries, Denmark, Portugal, Spain, Switzerland, Turkey, European Community), Eastern Europe (Czechoslovakia, Hungary, Poland, Russia, Yugoslavia, Eastern Bloc countries, Eastern Europe countries), Oceania (Australia, New Zealand), and Western Hemisphere (Argentina, Brazil, Chile, Mexico, Peru, Uruguay, Venezuela, Latin-American Free Trade Assoc. countries, Canada, U.S.).

Motor Vehicle Manufacturers Assoc. of the United States,  
Inc., Statistics Dept., 300 New Center Bldg., Detroit, Mich.  
48202  
1978; 246p refs  
Availability: Corporate author \$20.00

HS-025 798

**HIGHWAY HAZARDS: WHAT SOME STATES ARE DOING FOR THEM**

Solutions to hazardous locations on highways by various state departments of transportation are reported. A variety of approaches are being taken by the states including the effective identification of problem locations, and use of detailed and often computerized surveillance systems. In light of limited availability of funds, prioritization of correctional projects is a major point of focus. Another aspect of highway safety receiving attention is tort liability for highway maintenance. Most states are also dealing with hazards caused by narrow, one-lane bridges. Hazardous-location identification and surveillance activities of the Connecticut Bureau of Highways and the North Carolina Dept. of Transportation are described, as is prioritization of highway safety projects as carried out by the Washington State Dept. of Transportation and the New York State Dept. of Transportation. The experience of the Michigan Dept. of State Highways and Transportation regarding tort litigation, and the state's efforts to improve highway crew safety are reported. Efforts by the transportation departments of Kansas, California, North Carolina, Arkansas, and Virginia to ameliorate the narrow, one-lane bridge safety problem are cited.

Publ: Better Roads v48 n9 p16-9 (Sep 1978)  
1978; 2refs  
Availability: See publication

HS-025 799

**SPEED CONTROL HUMPS IN NORWICH AND HARINGEY [ENGLAND]**

The one-year trial experience of speed control bumps designed by the Transport and Road Res. Lab. and installed on two public roads in England (Motum Rd., Norwich, and Palace Rd., Haringey) is reported. The speed bumps were designed to overcome the disadvantages of the short, high, rather severe design of bumps commonly used, i.e. vehicle underside damage, and discomfort to vehicle occupants with increased vehicle speed. The newly designed bumps are 3.7 m long and 100 mm high and semicircular in profile. Details are given of public notification, the method of construction, siting and signing, public reaction, and effects on traffic and accidents. The speed bumps on these roads appeared to be effective in reducing vehicle speed and traffic flow. They were acceptable to the majority of residents and drivers. Traffic casualties were reduced during the one-year period.

by R. Sumner; C. Baguley  
Transport and Road Res. Lab., Road User Characteristics  
Div., Crowthorne, Berks., England  
Rept. No. TRRL-SR-423; 1978; 24p 4refs  
Availability: Corporate author

HS-025 800

**CLOSE FOLLOWING BEHAVIOUR AT TWO SITES ON RURAL TWO LANE MOTORWAYS [ENGLAND]**

Close-following behavior by drivers on rural, two-lane roads has been studied at two locations in England (between junctions 23 and 22 on the M4, and between junctions 4 and 3 on the M5), and results have contributed to an International

Drivers' Behaviour Res. Assoc. project on possible national differences in drivers' risk taking. Video equipment was used to monitor 7325 vehicles, during periods of maximum and minimum traffic flow conditions at each site. Close following was analyzed in relation to the flow, lane, speed, and vehicle type. Platoon size distribution was also considered. It was found that 31% of drivers were following the vehicle ahead with a gap of less than 2 sec and that one-half of these were within 1 sec. A greater proportion of heavy-goods vehicles than lighter vehicles was found to follow closely, particularly in the passing lane. The percentage of heavy-goods vehicles leading platoons in this lane was almost double that of lighter vehicles. A platoon is defined as at least one vehicle following another with a gap of 2 sec or less, where the difference in the vehicles' speeds is less than 10%.

by R. Sumner; C. Baguley  
Transport and Road Res. Lab., Road User Characteristics  
Div., Crowthorne, Berks., England  
Rept. No. TRRL-LR-859; 1978; 22p 5refs  
Availability: Corporate author

HS-025 801

### INJURIES TO OCCUPANTS OF HEAVY GOODS VEHICLES

Findings are presented of an in-depth investigation into the patterns and causes of injury in a sample of 59 seriously or fatally-injured occupants of heavy-goods vehicles (HGV's) who were involved in accidents in England between May 1965 and Jun 1974. All fatal injuries were found to be associated either with massive intrusion of the cab structure or with ejection of the occupants. This pattern of death is different from that found among unbelted passenger car occupants. A comparison between the patterns, causes, and mechanisms of injury, more severe than minor, sustained by HGV occupants and car occupants showed differences in the injury patterns and causes of injury, particularly with respect to head, pelvis, and lower leg injuries. The data suggest that the wearing of seat belts by HGV occupants might have reduced the injury severity for about 1/3 to 1/2 of the casualties in this small sample, and that making the cab more resistant to the crushing of its occupants, with careful component design to alleviate injury to the lower limbs, torso, and head, could add to the protection offered by the seat belt.

by E. Grattan; J. A. Hobbs  
Transport and Road Res. Lab., Accident Investigation Div.,  
Crowthorne, Berks., England  
Rept. No. TRRL-LR-854; 1978; 14p 8refs  
Availability: Corporate author

HS-025 802

### THE MOBILITY OF OLD PEOPLE: A STUDY IN GUILDFORD [TRAVEL PATTERNS, ENGLAND]

An overall explanation is provided for the travel patterns of the elderly, and the role of transport in their everyday lives, based on a Oct 1975 survey conducted among 647 retired but active old people living in Guildford, England. Variations in travel patterns are explained in terms of personal background, health, type of household, and area of residence in the town. Ill health and car availability are shown to have important effects upon travel behavior; ill health became increasingly significant among older respondents and became more important

than the influence of financial position and social background. Some groups were found to be able to cope with transport problems better than others. Those living alone had to carry out more everyday activities than others, but had more difficulty in traveling. The people living near the town center had better access to a range of facilities, even if they had difficulty in traveling, than those who had to use motorized transport to reach a full range of facilities. It is suggested that improvements in transport and land-use planning, and in the provision of personal social services could assist the elderly in meeting their essential requirements. Appended are explanation of sampling method and questionnaire, description of data handling, and sample characteristics.

by Jean M. Hopkin; P. Robson; S. W. Town  
Transport and Road Res. Lab., Access and Mobility Div.,  
Crowthorne, Berks., England  
Rept. No. TRRL-LR-850; 1978; 66p 21refs  
Availability: Corporate author

HS-025 803

### THE CHALLENGE OF ENERGY CONSERVATION TO THE COMPOUNDER [RUBBER INDUSTRY]

An explanation is given of a method to save energy in the internal mixing stage of rubber processing by optimizing compounding ingredients, processing conditions, and machine parameters. Subdividing the rubber charge into various numbers of pieces can result in peak power and/or total energy savings of 10% to 15% during an upside-down mixing cycle. Further savings can be achieved by using rubber in powder form, although production of powdered rubber itself requires energy. The loading and type of carbon black can affect peak and total power. By using high structure, high surface area blacks, which are often required for maximum performance, energy consumption is maximized. It is economically worthwhile to determine whether adequate product properties can be maintained with a high structure, low surface area black or with blends of low and high structure blacks. There are a number of compounding ingredients which are specifically designed to reduce energy usage during mixing. In terms of processing conditions, it is important to optimize batch size, the mixer metal temperature for each elastomer (which is dependent on the circulating water temperature), the order of adding compounding ingredients. The criterion for dumping can also significantly influence the energy consumption of a mix. Recent studies have shown that power-controlled mixing can reduce energy consumption by up to 50% compared to conventional time and temperature controlled methods. It is advantageous to monitor power usage to obtain reference points necessary in any energy conservation program. Optimization of machine parameters involves such items as monitoring cooling water flow rates and changes in temperature, using a power override on the ram pressure to prevent power surges, maximizing the power factor, and measuring clearance between rotor and chamber wall at regular intervals.

by P. S. Johnson  
Publ: Elastomerics v111 n2 p30-3 (Feb 1979)  
1979; 14refs  
Based on paper presented to Southern Rubber Group, Tampa, 10 Nov 1978.  
Availability: See publication

HS-025 804

**AUTOMOBILES: NEW VIGOR FOR AN ENDANGERED SPECIES**

The evolution of automotive engineering in the U.S. auto industry is reviewed, including considerations of overcoming the fuel knock problem, improvements in engine design, optimization of materials, front-wheel drive applications, advances in automatic transmissions, research in electric vehicles, aerodynamics in vehicle design, response to safety regulations, and application of electronics. The auto industry has displayed an astonishing ability to adapt to the times. Specific emphasis is placed on the industry's approaches to meeting current fuel economy standards by downsizing cars, using lightweight materials (plastics, aluminum, high strength steels), applying electronics and aerodynamics in vehicle design, and developing more efficient engines. It is pointed out that automotive design is coming full circle, with renewed emphasis on small, lightweight vehicles powered by four-cylinder engines.

by Clare E. Wise

Publ: Machine Design v51 n4 p26-30, 34-8, 44-8, 50-1 (22 Feb 1979)

1979; 2refs

Availability: See publication

HS-025 805

**A REPLY TO NHTSA'S [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] ASSERTIONS THAT REPEAL OF MANDATORY HELMET LAWS IS THE MAJOR FACTOR IN INCREASED 1977 MOTORCYCLE FATALITIES**

After an examination of available current data on motorcycle accidents, fatalities, registrations, and licensure, as well as such relevant topics as weather conditions, the American Motorcycle Assoc. finds that the National Hwy. Traffic Safety Administration (NHTSA) is altogether premature in its judgment that the approximate increase of 23% in motorcycle fatalities in the U.S. in 1977 over 1976 is primarily the result of the reduced use of helmets by motorcyclists after 26 states repealed their helmet laws. It is pointed out that NHTSA has used noncomprehensive data and has failed to give other factors adequate consideration. NHTSA has overlooked the fact that 18 of the 26 repeal states in 1977 maintained a helmet law for individuals under 18 years of age, a group whose experience level makes it heavily represented in accident data, indicating that a significant portion of the fatalities were in fact helmeted. No assessment was made of what portion of the increase actually involved motorcycles. There was accurate recording of motorcycle accidents by 13 of 50 states; others included mopeds and other vehicles. There were inconsistencies in describing causes of overall fatality increases, depending on whether the subject was cars or motorcycles. The NHTSA conclusion is contradictory to Fatal Accident Reporting System data. NHTSA cannot be accurate within 31% as to whether or not a fatally-injured cyclist was wearing a helmet. Of the 9 states with the worst fatality/registration ratios in 1977, 8 maintained their helmet laws; two traditional non-law states (California and Illinois) had increased ratios in 1977. NHTSA did not adequately acknowledge a growing motorcycling population indicated by increased licensing of new motorcyclists, use and weather indicators that suggest increased exposure per vehicle, and increased exposure per vehicle resulting from possible increased passenger use. A comparison

of repeal vs. helmet law states shows a higher fatality/registration ratio in the latter. No significant difference is evident in fatality-accident ratio in helmet law vs. repeal states.

American Motorcycle Assoc., Dept. of Government Relations,  
P.O. Box 141, Westerville, Ohio 43081  
1978; 16p 5refs

Availability: Corporate author

HS-025 806

**RECENT ADVANCES IN ELASTOMER PROCESSING. SPECIAL REPORT**

Among recent elastomer processing developments for use in the auto industry is the first production Reinforced Reaction Injection Molding (RRIM) machine (Cincinnati Milacron's Plastics Machinery Div., Batavia, Ohio) delivered to Ford Motor's Detroit Res. and Devel. Center. The unit reportedly has a 50-lb shot size and injection rate of 10-11 lb/sec of filled urethane and 15 lb/sec of polyurethane. General Motors is reported to have solved the major processing problem of continuously drying the very hygroscopic milled glass reinforcement and continuously metering it into the agitated polyol tank. Bulk handling systems and automation have combined to radically improve output from sheet molding process lines. Another GM development in the sheet-molding compound area is "in-mold coating" which reportedly eliminates the need for priming the part surface before painting. The latest trend to increase productivity of molding operations is to provide computerized control logic; these controls, in general, periodically monitor process parameters at critical times and locations, compare obtained values with optimum conditions stored in processor memory, and institute signals to machine controls to adjust and maintain machine conditions. For productivity purposes, a microprocessor-based unit, Midas I (Control Process, Inc., Plantsville, Conn.), is available to collect and display production and management information on injection molding machines, up to 60 machines at a time. For combined machine control and management information monitoring capabilities, Hunkar Labs., Inc. (Cincinnati) has announced the MPC-III. The Taylor Instrument Co. offers a new 450R microprocessor-based sequence controller that can provide on-off control for up to 24 machine or process functions through a 1-to-29 step cycle. A new Universal Programmable Timer, the UP-Timer, is offered by Xanadu Controls (Springfield, N.J.), and is capable of simultaneously controlling up to 10 parallel, time-based operations. There are also a number of programmable controller and/or monitor units that can be adapted to a variety of process control applications.

by W. O. Murland

Publ: Elastomerics v111 n2 p25-8 (Feb 1979)

1979; 5refs

Availability: See publication

HS-025 809

**THE PROFITABLE EXHAUST SYSTEM BUSINESS**

Information is provided by the National Tire Dealers and Retreaders Assoc. (NTDRA) for the independent tire dealer and/or retreader who considers adding an exhaust system repair and replacement business to his tire operations. Mufflers, piping, and fittings are a product line that fits in perfectly with the facilities and services offered by tire dealers

and retreaders, who have the lifts, qualified personnel, and many of the tools to do the job. Only storage space and some specialized equipment and training pose problems, none insurmountable. Profitability is discussed; based on a \$56 per job average and a 32.8% profit margin, some \$6000 in annual revenue is possible for service stations with two bays and two mechanics, with \$2045 representing gross profits. Availability of parts is assured, since there are a host of manufacturers offering high-performance mufflers and components in a wide variety of shapes and sizes. Other equipment on the market includes pipe-bending machines, kits for measuring exhaust noises, and special tools such as pipe-end reshapers and muffler-cutting chisels. Exhaust systems manufacturers are optimistic about the market prospects, due to decreased longevity of new car exhaust systems, the trend in service station closings and conversions, growth of the imported car market (imports requiring service sooner), and boom in recreational vehicles. Shop operations are discussed; expertise and top quality service are deemed prime requisites. Objections expressed by some tire dealers to expansion into the exhaust system business are answered; points of contention concern compatibility with tire servicing schedule, adequate inventory, and capital investment. It is pointed out that once the decision has been made to enter the exhaust business, it pays to advertise.

Publ: NTDR Dealer News v42 n4 p13-4, 19-20 (26 Feb 1979)  
1979

At head of title: The Tire Service Specialist. Based in part on information provided by Goerlich's of Toledo, Ohio.  
Availability: See publication

## HS-025 810

# **EPA [ENVIRONMENTAL PROTECTION AGENCY] STANDARDS REGULATE EMISSIONS, SECY. ADAMS CALLS FOR ENGINE OF THE FUTURE**

After learning that many vehicles were being modified until they did not comply with the auto exhaust standard they originally met, the Environmental Protection Agency (EPA) decided in Jan 1979 to require manufacturers to limit the amount of adjustability in emission control systems. Responding to manufacturers' requests for more lead time, EPA delayed implementation of the new regulation until the 1981 model year. With authority to set standards only and not to decree manufacturing specifications, EPA expects car makers to fit physical limiters on the adjustable features to prevent changes that would result in excess emissions. After emissions controls were introduced, EPA announced that a mass program to remove emission controls from cars would most likely result in no net gain and possibly a loss in fuel economy, a claim that was borne out later by the results of a test program conducted by EPA itself. In 1977, a new tampering prohibition clause was included in amendments to the Clean Air Act, broadening the scope to cover repair facilities and fleet operators (in addition to any person with respect to unsold new cars and to manufacturers and car dealers with respect to sold cars). In the wake of this concern for air pollution and fuel economy, Secretary of Transportation Brock Adams has challenged the auto industry to join in a maximum effort to search for the engine of the future and has called for an automotive summit conference early in 1980. A detailed definition of il-

legal tampering with automotive emission controls is presented in a separate section.

by Inez Watson  
Publ: NTDR Dealer News v42 n4 p22-3 (26 Feb 1979)  
1979  
Availability: See publication

## HS-025 811

# **AUTO MAKERS USING COMPUTER TECHNOLOGY IN NEW EMISSIONS SYSTEMS**

Introduced by General Motors on some 1979 models in California, the three-way converter called C-4 (Computer Controlled Catalytic Converter) System is expected to be used on all GM cars in 1981. This advanced control system provides the technology to meet stricter emission standards of the 1980's while giving good fuel economy and driveability. The C-4 System uses a three-way converter which, aided by electronic engine controls directed by an on-board computer, reduces nitrogen oxides as well as "burning" hydrocarbons and carbon monoxide. Ford Motor's latest advance in exhaust systems, EEC-II (Electronic Engine Control), was offered on the optional 5.8 L (351 cu-in-displacement Windsor) V-8 engine in the 1979 Mercury Marquis in all 50 states and on the same engine in the 1979 Ford LTD in California. The EEC-II system interactively controls engine spark advance, exhaust gas recirculation, and air-fuel ratio. By recognizing all of the modes in which the vehicle is operated and making all of the necessary adjustments to these key engine functions, the EEC-II system provides optimum control of emissions and fuel economy, and helps provide top engine performance.

by Ed Janicki  
Publ: NTDR Dealer News v42 n4 p8-9, 21 (26 Feb 1979)  
1979  
Availability: See publication

## HS-025 812

# **LET'S DECLARE WAR ON TRAFFIC ACCIDENTS**

The Dealers Safety and Mobility Council, an arm of the Hwy Users Federation, has placed emphasis in its traffic safety program on two high-payoff safety improvements: the greater use of safety belts and observance of the 55 mph speed limit. With the cooperation of the automobile and tire manufacturers, program has been devised which will reinforce the efforts of dealerships to get their communities to observe safety belt use and the 55 mph speed limit. Dealers are aware of the potential of seat belt usage in saving an estimated 10,000 to 15,000 lives a year, but they are also aware that very few people do buck up. The dealer realizes that alternative safety devices to the seat belt may be mandated by the government and he fears that he and his customers can ill afford the higher cost of vehicles with new equipment which may not be as effective as the safety belt. Dealers are aware that the highway fatality rate fell dramatically after the implementation of the 55 mph speed limit and that observance of the limit conserves fuel (estimated saving of 1 billion gal in 1975, when the 55 mph law was made permanent). Dealers around the U.S. are going to do everything possible, through the cooperative Dealers Council,

informational program, to promote the use of safety belts and compliance with the 55 mph limit.

by Lee J. Beaudry

Publ: Cars and Trucks v51 n1 p32-3 (Feb 1979)

1979

Availability: See publication

HS-025 813

# **WARNING--BUREAUCRATS AT WORK: STATES AND MANUALS. LEARNING TO RIDE BY THE BOOK [MOTORCYCLE LICENSES AND DRIVER'S MANUALS]**

Based on a review of 44 states' driver's manuals, the motorcycle section of these manuals is criticized. A review of each state's approach to motorcycle operator licensing procedures (in tabular form) and of some salient features of states' manuals is included. It is pointed out that most manuals have been written by persons who are unacquainted with motorcycles. Although it is felt that riding a motorcycle is not easily learned from a manual, it is pointed out that 12 states were aware that in order to write adequately about the subject of motorcycling, expertise is required. These states (Alabama, Alaska, Kansas, Mississippi, Nevada, New York, North Dakota, Ohio, Pennsylvania, Tennessee, Utah, Wyoming) have adopted the new MSF/NHTSA (Motorcycle Safety Foundation/National Hwy. Traffic Safety Administration) Motorcycle Operator's Manual. It is emphasized that the MSF/NHTSA manual reads as if it were written by motorcycle riders, and that this manual is vastly superior to those written for the states. The new manual's emphasis is on reasonable caution, expertise, and positive thinking rather than on shrill warnings about danger. NHTSA and MSF are also working on getting a more uniform and realistic approach to the licensing of motorcycles in all 50 states, including programs for rider education similar to those for automobiles, and on continuing to upgrade the present generation of manuals.

by George C. Larson

Publ: Cycle Guide v13 n4 p80-1, 84-5, 88 (Apr 1979)

1979

Availability: See publication

HS-025 814

# **COMPOSITE BRAKE PEDAL TESTED**

A graphite/epoxy composite brake pedal assembly has been designed and built, with strength and stiffness exceeding that of steel at less than half of steel's weight. The pedal meets all the specifications for the equivalent high strength low alloy steel production pedal assembly and is directly interchangeable with it. Failure mode is noncatastrophic. The pedal blade was formed from a hollow graphite/epoxy tube in a matched die mold. Potential for high-volume production is excellent. To use continuous fibers efficiently, the hollow tube shape was selected since this configuration has an efficient section modulus to resist both bending and torsional stresses. An orientation of plus/minus 30 degrees from the axis was selected for the blade design. The shape of the blade was dictated by tradeoffs between maximum resistance to applied loads and constraints of envelope and fabrication. The round tube was flattened in the vertical direction between pin and hub, to improve section modulus and bending resistance. To have the blade conform to the proper envelope and to make foot pad attachment easier, it

was bent and flattened horizontally from the pin to the pad end. To increase section modulus, the tube diameter was selected at the largest value (38 mm) which could be shaped and bent to fit envelope constraints. A significant portion of the composite brake pedal assembly weight is due to steel components. Preliminary experiments indicate that these may possibly be replaced by composites.

Publ: Automotive Engineering v87 n3 p38-40 (Mar 1979)

1979

Based on SAE-790393 "High-Performance Composite Brake Pedal Assembly," by R. S. Kiwak, R. M. Rusnak, and K. H. Fulmer.

Availability: See publication

HS-025 815

# **REINFORCEMENT STRENGTHENS INJECTION MOLDED PARTS [AUTOMOTIVE PARTS]**

Bailey Div., USM Corp., an Emhart subsidiary, has developed a process for producing injection-molded glass-fiber reinforced thermoset polyesters which offers a new set of opportunities to the designer, fabricator, and assembler of external auto parts. The process competes with sheet molding and provides some advantages in surface quality, part-to-part uniformity, and manufacturing economics not found with the compression process. The first commercial application is the headlamp armature for the 1979 model Chevrolet Monza 2-plus-2. Fascia retainers for the Plymouth/Dodge Horizon TC3/Omni 024 and the Ford Granada/Monarch grille opening panels are other applications, with more to come in the 1980 model year. Some of the key advantages of the Bailey process include lighter and thinner parts (ribs can be added), no sink marks on Class A surfaces, dimensionally-accurate parts (filling a closed mold), uniformity from part to part, attachment holes molded in, minimal deflashing, strong stud bosses, and no blistering in paint ovens. Goodyear Tire and Rubber Co. has shown that the physical properties of reaction injection molded (RIM) compounds can be modified by selecting appropriate reinforcement type and concentration, as has been possible with normal injection molding. Studies have been made using milled fiberglass and mica flake as reinforcing agents in the reinforced reaction injection molding of urethanes. Milled glass of 1.59 mm length and mica flakes were found to have a comparable effect on flexural modulus, coefficient of linear thermal expansion, and notched Izod impact, although elongation was severely reduced by the mica. A combination of low elongation and poor impact resistance indicate a major weakness of mica flake, with respect to milled fiberglass, as a reinforcement in RIM urethanes.

Publ: Automotive Engineering v87 n3 p50-6 (Mar 1979)

1979

Based on SAE-790209 "A New Process for FRP Auto Parts," by Robert G. Nelb; and SAE-790166 "Controlling the Physical Properties of RIM Urethanes with Non-Organic Reinforcement," by C. J. MacGregor and R. A. Parker.

Availability: See publication

HS-025 816

# **AUTOMOTIVE HSLA [HIGH STRENGTH, LOW ALLOY] STEEL ENTERS BAR AREA**

A new as-hot-rolled high strength, low alloy steel which has been developed for round and flat bar applications has a 550 MPa (80 ksi) minimum yield strength with good bendability,



weldability, and fatigue performance. This material offers automotive designers and manufacturers flexibility either to upgrade from lower-strength materials through increased load-carrying ability of their present structures or to realize important weight and energy savings via lighter sections for present load ratings. Cost of the higher strength steel is less than that of heat-treated grades. The product's composition is basically that of a carbon-manganese steel with appropriate microalloy additions to optimize the precipitation-strengthening mechanism. The microstructure is typically fine-grained ferrite-pearlite, significantly finer than that of as-hot-rolled 1018 steel; the grain size typically ranges from American Society for Testing and Materials size no. 10-11. Several production trials have been conducted to date, and materials have been provided for evaluation by potential customers. Successful use of the material has been made by several manufacturers in the following applications: automotive (steering components, suspension components), truck-trailer (main load-bearing I-beams (flange materials), holding straps), and fork-lift truck (vertical extension arm, flange material, and base legs).

Publ: Automotive Engineering v87 n3 p60-3 (Mar 1979)  
1979

Based on SAE-790027 "The Development of a New HSLA As-Hot-Rolled Bar Product," by D. R. DiMicco, G. M. Waid, D. W. Demianczuk, D. W. Dickinson, and A. T. Davenport.  
Availability: See publication

#### HS-025 817

### HIGH STRENGTH ALUMINUM ALLOYS MINIMIZE BODY PANEL WEIGHT

Alcoa engineers have developed alloy selection and/or geometrical design guidelines which lead to least-weight aluminum auto body panel designs, both outer and assembled. Rather than establishing minimum thickness values, which depend on performance requirements set by vehicle designers, the engineers considered trends for least-weight designs. Performance relative to steel has been identified where possible, since some requirements are based on its historical performance. Denting, local stiffness, torsional and/or bending stiffness, strength, and vibration were considered in developing these design aids. When denting, permanent set, and crippling are the governing criteria, high-strength alloys provide lowest panel weights. If stiffness governs, redesign to reduce size of unsupported outer panel areas or to increase inner rib size is most effective.

Publ: Automotive Engineering v87 n3 p66-71 (Mar 1979)  
1979

Based on SAE-790164 "Minimizing the Weight of Aluminum Body Panels," by R. L. Rolf, M. L. Sharp, and W. C. Herbein.  
Availability: See publication

#### HS-025 818

### WINDSHIELD WIPER SYSTEMS EXPAND PLASTIC USE

Use of plastics in windshield wiper systems has evolved to the point where wiper sets, consisting of motor, linkage, arms, and plastic blades, contain 8% plastic by weight, and washer sets, consisting of pump, reservoir, and nozzles, contain 73% plastic by weight. Gradually, plastics have brought wiper designers more desirable characteristics than traditionally used metals; advantages of plastics include higher tensile strength,

fatigue resistance, service at greater temperature extremes, lower coefficient of friction, self-lubrication, electrical insulating properties, and resistance to heat aging, oxidation, and weathering. After numerous attempts at design and material selection; the plastic wiper blade was developed as an alternative to the long-standing all-metal superstructure blade for some applications. The superstructure is molded of a reinforced polyester compound with high strength and dimensional stability and with excellent thermal properties. The wiper blade has high resistance to longitudinal, transverse, and torsional loading, and provides impact resistance. It is unaffected by the range of chemicals encountered in automotive production and use. It remains stable under ultraviolet radiation and remains unchanged after continuous exposure to weather. The windshield is uniformly cleaned throughout the length of the blade over various windshield curvatures and with a wide range of wiper arm loads. The blade element reverses at the start of each wiping stroke. Blade friction is within the range established to achieve wiping without exceeding torque output of the power source. Vision is maintained at highway speeds even with gusting crosswinds. Operation is quiet. A modest weight reduction compared with some metal blades is offered.

Publ: Automotive Engineering v87 n3 p74-8 (Mar 1979)  
1979

Based on SAE-790201 "Plastic Components for Windshield Wiper Systems," by Richard A. Batt.  
Availability: See publication

#### HS-025 819

### COATING MATERIAL ENHANCES ALUMINUM SURFACES [AUTOMOTIVE APPLICATIONS]

A new technology involving a highly inorganic Dow Corning proprietary material has been developed which forms a clear, thin, hard coating for protecting bright aluminum surfaces from environmental degradation. Excellent resistance to both abrasion and humidity is exhibited, compared to more familiar alternative coatings (anodizing, chrome plating). Many auto parts, particularly those of steel and zinc, are potential candidates for replacement by aluminum in the interest of weight saving; of these, a substantial number require a bright, reflective surface finish for styling purposes (e.g. wheels, bumpers trim). The new coating material can be handled and applied by conventional organic paint techniques while providing properties similar to inorganic finishes. The inorganic material makes use of organosilicon chemistry to facilitate handling in a manner typical of organics. Its low potential for further reaction provides exceptional resistance to a wide variety of chemical attack, and its low reactivity to sunlight prevents yellowing from exposure. The degree and nature of the chemical bonding involved allow this material to withstand extreme temperatures and temperature fluctuations. The material's resistance to salt-induced corrosion and its excellent adhesion and abrasion resistance make it a strong candidate for styling aluminum wheels. It could allow use of lower-purity, less expensive alloys for aluminum bumpers which would be polished to the desired surface appearances. It could be used to protect aluminum trim in all but the most abrasive areas.

Publ: Automotive Engineering v87 n3 p80-2 (Mar 1979)  
1979

Based on SAE-790446 "A New Concept in Aluminum Surface Protection," by Pete Didrichsons.  
Availability: See publication



HS-025 820

**SPEED CONTROL UNIT GETS SMALLER, ADDS FUNCTION [1979 FORD CARS]**

A new Ford Speed Control Amplifier has been designed using an Integrated Injection Logic custom integrated circuit (IC). The IC's contain both analog and digital functions on a single substrate. Designs have resulted in a speed control unit providing more features, reduced package size, and lower warranty return projections than the prior design (introduced on 1969 models). The new system, with its custom hybrid, large-scale integrated circuit which uses Integrated Injection Logic technology, replaces the all-discrete-component electronics of its predecessor. A "resume" feature, not previously offered, has been incorporated into the system, which is now available for manual transmission applications. The new IC design can replace any Ford speed control module original equipment back to 1974 and will be used for service stock for these vehicles. Steering wheel assemblies (containing the control switches) for pre-1979 cars will preclude the resume function (reestablishing a previously set speed) so that functionality of the replacement amplifier will remain identical to the replaced unit. Though a small contributor to weight reduction, the weight of the 1979 speed control electronic module decreased by about 40% over its predecessor while also decreasing package size by the same amount. The reliability/warranty prediction for the new module shows about a 20% improvement from the earlier design. Manufacturability is enhanced by reductions in parts count and assembly procedures due to more integrated electronic functions. Pin-compatible IC's from all vendors are possible, and a common set of external components may be used with any of the IC's.

Publ: Automotive Engineering v87 n3 p84-7 (Mar 1979)  
1979

Based on SAE-790339 "Ford Speed Control Utilizes I2L Technology," by L. N. Benoit, S. A. Leszczynski, and R. R. Pilkington.

Availability: See publication

HS-025 821

**TITANIA: A NEW OPTION IN EXHAUST SENSORS [AUTOMOTIVE EMISSION CONTROL SYSTEM]**

Development of an exhaust gas sensor based on titania (TiO<sub>2</sub>) vs. zirconia (ZrO<sub>2</sub>), to determine the oxygen content of automotive exhaust, has continued for several years at Ford Motor Co. and has evolved to the pilot production stage. A key element of three-way catalytic converters (for removal of carbon monoxide, hydrocarbon, and nitrogen oxides in exhaust) is an air-fuel ratio (A/F) sensor used in a feedback control loop to sense and maintain that ratio in a narrow range near stoichiometric balance; overall efficiency of a three-way catalyst peaks near that ratio. Present emission control systems are based on the exclusive use of a ZrO<sub>2</sub> sensor which senses the large change in oxygen partial pressure at the stoichiometric A/F. Because of the magnitude and sharpness of this change, the ZrO<sub>2</sub> sensor output exhibits a stepwise change in output, which constrains the control system to operate in a limit-cycle mode. The temperature-compensated TiO<sub>2</sub> element sensor developed by Ford is rapidly responsive to these large excursions in exhaust gas oxygen partial pressure. Engine dynamometer and vehicle tests of the sensor's performance and durability have demonstrated its suitability

for use with today's emission control equipment developments.

Publ: Automotive Engineering v87 n3 p88-94 (Mar 1979)  
1979; 1ref

Based on SAE-790140 "Titania Exhaust Gas Sensor for Automotive Applications," by M. J. Esper, E. M. Logothetis, and J. C. Chu.

Availability: See publication

HS-025 822

**TECHNIQUES FOR MONITORING AUTO OCCUPANCY AND SEATTLE AREA RESEARCH RESULTS. FINAL REPORT**

Research was directed to observing variations in peak hour auto occupancy on different days of the week, monthly, seasonally, and along major corridors in the Seattle, Washington area during a 15-month period in 1977 and 1978 (12 months of data analyzed). Data were also collected on time of day variations, central business district (CBD) cordons, and special traffic generators and tested for error in field collection through redundant counts at various stations. Data collection procedures, statistical analysis procedure (including an evaluation of applicability and usefulness of different procedures for exploring different kinds of variations), and study results, along with an evaluation of their relevance for future auto occupancy studies, are discussed. Appended are guidelines for conducting a vehicular occupancy monitoring program. None of the variables investigated (type of facility, traffic volume, level of transit service, distance to the CBD, and urban vs. suburban location) showed a relationship with average auto occupancy. There was also no significant predictable variation by day of week, month, or season, counter to the study hypothesis. It is concluded that to accurately assess changing commuter patterns, a long-term program should be instituted to monitor carefully selected sites at regular intervals, perhaps monthly. Occupancy rates should be plotted regularly to view changes in terms of external circumstances. In the Seattle area, 9 of the 18 sites from the present study have been chosen for such an ongoing program. In cases where ongoing programs are not feasible, it may still be of interest to attempt to assess the impact of an individual ridesharing promotion effort or other change in circumstances.

by William T. Roach; Martha Lester  
Seattle-King County Commuter Pool, Arctic Bldg., Room 600,  
704 Third Ave., Seattle, Wash. 98104

DOT-FH-11-9261

Rept. No. FHWA-RD-78-198; 1978; 43p 3refs  
Provision of some data collection funds through  
Comprehensive Employment and Training Act.  
Availability: NTIS

HS-025 823

**SMASHED. THE MAGAZINE ON DRINKING-AND-DRIVING (IMPACT. LA REVUE DE L'AUTOMOBILE ET DE LA SOBRIETE)**

In a magazine format, up-to-date information is provided on the effects of alcohol and other drugs on driving ability and the laws related to drinking-and-driving. Individual articles provide discussions of the likelihood of the impaired vs. the unimpaired driver to be killed in a motor vehicle accident; blood alcohol concentration (BAC) and drinking-driving laws

in Canada; the physiology of alcohol; the effect of drinking on behavior; the effect of drinking on driving; the effects of mixing alcohol and other drugs on driving ability; BAC (including charts for females and males on estimating BAC according to person's weight and number of drinks consumed); methods of self-evaluating impairment (Romberg's test, collecting small objects, counting backwards); helpful hints for parties; and a quiz to help one stay sober. "Cartoons" and "advertisements" on the theme of drinking-and-driving are included. Wallet-size BAC charts are attached.

Transport Canada, Road and Motor Vehicle Traffic Safety Branch, Ottawa, Ont. K1A 0N5, Canada  
Rept. No. TP-1535; 1978; 74p  
Duplicate volume in French (36p).  
Availability: Corporate author

HS-025 824

### **THE 79'S ARE LARGER INSIDE AND STRONGER OUTSIDE, BUT...WHERE DID THE WEIGHT GO? [U.S. AUTOMOBILES]**

The two basic ways the auto industry reduced vehicle weight in 1979 model year cars are briefly explained: by downsizing and by using lighter-weight or lighter-gauge materials. High-strength and lighter-weight steel, and aluminum were substituted for ordinary low-carbon steel and cast iron in various areas to reduce total vehicle weight without sacrificing strength or durability. In actual practice, automotive engineers were able to reduce vehicle weight by 630 lb on a production-type vehicle of the theoretical engine variety. A weight comparison table of 1979 aluminum vs. 1978 cast iron engine components shows a 39.4 lb reduction for the former. An interior space comparison chart of the 1978 vs. 1979 Newport shows that 715 lb (curb weight, V-8) were removed from the basic vehicle in the newer model without sacrificing interior room and seating comfort. Weight savings have also been achieved by using thinner, but equally strong and durable, window and windshield glass. The Ford Fairmont and Zephyr lines are cited as representing excellent weight-savings techniques, e.g. use of much aluminum and plastic, thinner doors with less curvature, and trimmer and lighter axle housings, despite their construction from ferrous metal. Examples of future weight reduction include a "4x8" Ford engine, which will run on either four or eight cylinders depending on operating condition; a lockup converter bypass applied to an over-drive/automatic; and graphite fiber material, which results in weight savings of 1250 lb in a car over a 1979 model of conventional construction.

by Herb Carrier  
Publ: Brake and Front End v49 n2 p28, 30-1, 34 (Feb 1979)  
1979  
Availability: See publication

HS-025 825

### **MOTOR GASOLINES, SUMMER 1978**

Analytical data for 2433 samples of motor gasoline, from service stations throughout the U.S., were collected and analyzed. The samples represent the products of 50 companies, large and small, which manufacture and supply gasoline. These data are tabulated by groups according to brands (unlabeled) and grades for 17 marketing areas and districts into which the U.S. is divided. A map shows marketing areas, dis-

tricts, and sampling locations. Charts indicate the trends of selected properties (distillation temperature, Reid vapor pressure, octane numbers) of motor fuels since 1946. Twelve octane distribution percent charts for areas 1, 2, 3, and 4 (Eastern and Gulf Coast states, Central states, Mountain states, and Western states) for unleaded, regular, and premium grades of gasoline are presented. The antiknock (octane) index averages of gasolines sold in the summer of 1978 were 88.5, 89.5, and 94.3 for unleaded, regular, and premium grades of gasolines, respectively. The report does not discuss the significance of the data presented.

by Ella Mae Shelton  
Department of Energy, Bartlesville Energy Technology Center, Bartlesville, Okla.  
Rept. No. BETC/PPS-79/1; 1979; 81p 2refs  
Supported in part by the American Petroleum Inst.  
Availability: NTIS \$6.00 paper copy, \$3.00 microfiche

HS-025 826

### **A PROGRAM FOR THE MONTE CARLO SIMULATION OF VEHICLE TRAFFIC ALONG TWO-LANE RURAL ROADS. AN APPLICATION OF STRUCTURED PROGRAMMING TECHNIQUE AND SIMULA-67 LANGUAGE**

A description is given of a computer program for simulating vehicle traffic on two-lane, rural roads which is part of a long-term research and development project by the National Road and Traffic Res. Inst. of Sweden to determine the effect on traffic of road and traffic engineering schemes in order to establish traffic quality and road-user costs in the rural road network. The Jackson Structured Programming technique was used, in the SIMULA 67 program language. The simulation model describes the dynamic sequence of vehicle traffic over defined stretches of road for given traffic volumes and compositions. On the basis of its applications, one part of the model gives the speed of the freely-moving vehicle along the road (free-flow traffic), and another part shows the interactions of individual vehicles in the traffic stream. Input data consists of road parameters (road geometry, surface type, speed limits, and overtaking restrictions) and traffic parameters (total flow, or number of vehicles/hour, flow in each direction, flow changes, and traffic composition). Validation of the basic traffic model is in progress in both Sweden and the U.K. A preliminary program description is provided, as well as a source program list.

by Anders Brodin; Gosta Gynnerstedt; Goran Levander  
Statens vag- och trafikinstitut (VTI), Fack, 58101 Linköping, Sweden  
Rept. No. VTI-143; 1979; 80p 6refs  
See also HS-025 838 (VTI-44), and HS-025 839 (VTI-43).  
Availability: Corporate author

HS-025 827

### **BMCS [BUREAU OF MOTOR CARRIER SAFETY] ROADSIDE SAFETY INSPECTIONS 1976-1977**

A summary of roadside inspection activities of the Bureau of Motor Carrier Safety (BMCS) for the years 1976 and 1977 is divided into four parts: trucks 1976, trucks 1977, drivers 1976 and 1977, and buses 1976 and 1977. The BMCS administers and enforces the Federal Motor Carrier Safety Regulations and Hazardous Materials Regulations applicable to motor car-

riers of passengers and/or property engaged in interstate and/or foreign commerce. Tables provide the total number of vehicles inspected, the total number of types of vehicle defects found, and the total number of these violations which caused a vehicle (truck, bus) to be placed out of service, for authorized carriers, private carriers, exempt carriers, and other carriers. Pie charts show percentages of such types of driver violations as medical certificate, log violations, and miscellaneous (e.g. seat belt use, safe loading, transportation of unauthorized passengers) by carrier type; the total number of driver violations and the number causing drivers to be placed out of service are indicated. In 1976, 14,730 vehicles engaged in the transportation of property in interstate commerce were inspected, and 35% (5225) of these were placed out of service; in 1977, 18,421 vehicles were inspected, with 34% (6214) placed out of service. In 1976, 16,172 driver violations were found, with 419 drivers being placed out of service for driving or being on duty in excess of the maximum hours; the corresponding figures for 1977 are 18,412 and 427. In 1976, 1533 interstate buses were inspected, and 6% (97) were placed out of service; the corresponding 1977 figures are 1423 and 9% (123). The attention of the trucking industry is called to the sizeable segments of their industry which do not have effective inspection/maintenance programs and to the abundance of easily found defects in important areas such as brakes, wheels, and tires. Credit is given to the passenger carriers for their efforts in reducing out-of-service frequency and for the fact that, in almost half of the inspections, the buses were free of even minor defects. Concern is shown regarding the 1977 rise in both frequency of defects and out-of-service defects, a reversal of the declining trend in recent years.

Bureau of Motor Carrier Safety, Washington, D.C. 20590  
1978; 38p

Availability: Corporate author

#### HS-025 828

### EVALUATION OF THREE-WAY INTERSECTION REGULATION [WESTERN AUSTRALIA]

Findings are outlined of a study which evaluated the regulation introduced in Western Australia in Jun 1975 determining right-of-way obligations of drivers at uncontrolled, three-way intersections. Under the new regulation, drivers on the terminating road must give the right-of-way to all drivers on the continuing road. It was found that prior to the new regulation, the majority of drivers were already adopting the major/minor road concept, a pattern found to be strengthened by the new regulation. The new regulation has apparently been beneficial in reducing driver hesitations and in embodying a self-enforcing law, which is of benefit to the law enforcement authority. An analysis of 200 intersections provided no statistically significant changes with respect to road accidents, although there is some indication that the new regulation may have reduced rear-end collisions on the continuing road involving vehicles approaching from the left of the terminating road. A limited study has indicated that driver delays on the terminating road may have increased slightly as a consequence of the new law. Although not directly measured in this study, it is considered that further possible benefits of the new regulation include smoother traffic flow on the continuing road and the designation of major roads as priority roads, thus eliminating the need

to sign three-way intersections unless warranted on the grounds of safety.

by P. Willett

Publ: Australian Road Research v8 n2 p39-43 (Jun 1978)  
1978

Availability: See publication

#### HS-025 829

### THE EFFECT OF PRESENCE LIGHTS [RUNNING LIGHTS] ON THE DETECTION OF CHANGE OF VEHICLE HEADWAY

A laboratory study was undertaken to investigate the effect of vehicle rear lights on the detection of change in visual angle of a lead vehicle by a following vehicle (change in headway). The elements of car following on the road were simulated by reproducing the angular relationships on a screen which was viewed from a fixed distance. A test object representing the rear of a car was projected onto the center of a large, otherwise stimulus-free, screen of uniform luminance. The initial distance between the observer in the following vehicle and the rear of the lead vehicle (headway) was simulated by the initial angular size of the test object projected onto the screen. Acceleration of the lead vehicle was simulated by subsequent change in the angular size of the test object. Visual performance was measured by recording the reaction time to positive detection of change in headway. Test object configurations were square test object (vehicle only (VO)), vehicle plus presence lights (VPL), and presence lights only (PLO). It was found that the reaction time increases as the initial headway increases, as the light level decreases, and as the test stimulus is reduced to presence lights only. There was no significant difference between reaction times for the VO and VPL conditions, but reaction times for the PLO condition were significantly different from those for both VO and VPL. It can be inferred that road lighting can considerably improve driver response merely by making the outline of vehicles visible. Fixed lighting has the benefits of revealing the rear of vehicles and of raising the driver light adaptation level. Both front (headlights) and rear presence/brake lights and turn signals should not be so intense as to cause disability glare which veils the vehicle outline, and presence lights should be as close as possible to the sides of vehicles.

by A. J. Fisher; R. R. Hall

Publ: Australian Road Research v8 n2 p13-6 (Jun 1978)  
1978; 8refs

Availability: See publication

#### HS-025 830

### WAYS TO MAKE CYCLING SAFER

It is suggested that a fundamental rethinking of the bicycle in American society is required, that the "bicycle as a toy" mentality must be eliminated. Buying a bicycle should be a responsible act, and one should be as careful in riding a bicycle as in driving a car. The adult's role in bicycle matters is significant since the parent purchases the bike for a child and imparts his attitudes about cycling. It is suggested that bicycles bought at department or hardware stores, for example, need a lot more repair and maintenance than those purchased from local bike shops. In a cheaper production bike, as is often sold in department stores, the metal is thinner and the frame tubing is of poor quality. One common feature of department store bikes

(and a significant cause of accidents) is a bike being out-of-adjustment. Department store bikes are not sold in perfect adjustment and come out of adjustment easily. A relationship between "junk bikes" and "junk bike attitudes" is seen.

by James C. McCullagh  
Publ: Bicycling v19 n8 p8-10 (Aug 1978)  
1978; 1ref  
Availability: See publication

HS-025 831

### MAKING 55 MPH PAY

Continental Oil Co. (Conoco) has reaped benefits from its program to comply with the 55 mph speed limit, the principal one being a 25% increase in fuel economy (from 4 mpg in 1974 to about 5.1 mpg today). Conoco's fleet of 200 tractors and 400 trailers also relies on radial tires, fuel-efficient diesels, fan clutches, and aerodynamics to boost its fuel savings. Conoco was one of the principal sponsors of a research program at Texas A and M Univ. which studied tank trailer aerodynamics. Based on the study findings, Conoco has gone to conventional tractors vs. cab-over types, where possible, to cut drag and increase fuel economy. Conoco had already installed air shields on tractors hauling van trailers, but the company is now investigating air shields on tractors in tanker service. (The most promising shield is one originally designed for a recreational trailer.) Conoco installed tachographs in all its tractors in mid-1975 to monitor drivers' speeds. If a driver is found to have been speeding, he receives a written reprimand for his first offense, a week's suspension without pay for a second, and termination for a third infraction in a 12-month period. Another aspect of Conoco's 55-mph policy is mandatory attendance at monthly safety meetings. Signs of the rear of every Conoco trailer advertise the company's policy on observance of the 55 mph limit for safety and fuel economy reasons. Conoco also believes its policy has helped its safety record and lessened wear and tear on equipment.

by Brian Taylor  
Publ: Commercial Car Journal v136 n1 p103-5 (Jan 1979)  
1979; 1ref  
Availability: See publication

HS-025 832

### MEASURING FUEL ECONOMY...ON THE ROAD

After three and one-half years of preparation, the Dept. of Transportation/Society of Automotive Engineers Fuel Economy Prog. is currently carrying out its objective of testing vehicles in fleet service to measure fuel consumption and to identify the most fuel-efficient operating practices for future use in heavy-vehicle and component design. Tractor comparisons features standard components vs. high torque rise engines, temperature-controlled fan drives, radial tires, and air deflectors. Straight trucks will be tested with gas and diesel engines. With as many as 50 major carriers expected to participate, the initial test fleets include Gateway Transportation, Carolina Freight, Associated Truck Lines, and Gordon's Transport. Ford, International Harvester, General Motors, and White are providing the power units while Monon and Dorsey have donated the vans. (Specifications of test vehicles are tabulated.) Four pairs of vehicles are being evaluated; in each set, one truck will be equipped with fuel-saving components, the other with standard components. To make in-service verification possible,

Rockwell International developed a compact, on-board computer and a series of sensors that could evaluate 26 vehicle functions. Each volunteer carrier will operate the test vehicles for a maximum of one month. The in-service test vehicles are now completing their first run with a volunteer fleet. The program concludes at the end of the year. It is hoped that the in-service results will corroborate those of preliminary tests that indicate up to 40% fuel saving on vehicles equipped with fuel economy devices.

by Claude Travis  
Publ: Commercial Car Journal v136 n1 p98-102 (Jan 1979)  
1979  
Availability: See publication

HS-025 833

### THE CURRENT STATUS OF AUTOMOBILE RUNNING LIGHTS

Studies are cited which have demonstrated the traffic safety benefits of running lights (lighted when the engine is running) to increase motor vehicle conspicuity. Various accident studies have shown reductions in accidents ranging from 7% to 59% as a result of using either headlights during the daytime, parking lights in daylight hours, a light in the center of the grille, a high-mounted signal system, or an auxiliary truck-mounted brake light. One study found that a significant quickening of following driver response occurs when a lead vehicle has high-mounted brake and turn signals. A stabilizing effect of daytime headlights with regard to the lane position of oncoming cars has been found in another study. A series of studies has demonstrated that lighted vehicles (in the daytime) can be detected sooner, that lighted vehicles hold constant visibility with a logarithmic decrease in natural illumination, and that passing performance is safer if the oncoming vehicle has running lights. Increased visibility has been reported for vehicles with just two small running lights, as well as for motorcycles with low-beam headlights. The author advocates a high-mounted, 360 degree-visibility forward showing brake-turn signal light and running light combination, a system he believes could reduce accidents by 50% or more. This system (illustrated) is being tested in a three-year study by the Iowa Dept. of Transportation.

by Merrill J. Allen  
Publ: Journal of the American Optometric Association v50 n2 p179-80 (Feb 1979)  
1979; 16refs  
Availability: See publication

HS-025 834

### GOOD DRIVERS USE THEIR MIRRORS

Even the experienced driver, who uses his vehicle's mirrors more often and more effectively than the novice driver is handicapped by the limited rear field of view afforded by today's mirror systems. The traditional rear-view mirror, changed comparatively little since its introduction, is inadequate in providing rear vision information on today's highways. Modern car designs add to the problem; small back windows reduce the driver's rear field of view, and low, sloping roofs necessitate location of the inside mirror low on the windshield, where it can block the forward vision of the taller driver. The Dept. of Transportation is preparing a new standard that will require car makers to improve blind spots on either side of the

car. One approach, although costly and requiring development, would be an electronic or fiber optic system that displays the rear scene on a TV monitor on the dashboard. The simplest solution would be a large interior mirror mounted above the driver's line of vision, and more window space to the back and side; a serious drawback is a blocked view with a full load of passengers. The best solution would be a wide-angle periscope. An alternative is the multiple-mirror system (left and right outside mirrors to cover blind spots in addition to the central interior mirror); this approach complicates the viewing task. Flat mirrors cannot eliminate completely blind spots, and under new standards they may have to be replaced or supplemented with convex mirrors, which provide a greater field of view. Convex mirrors create a problem in judging distance and strain the focusing power of the eye, but they pinpoint vehicles in the driver's blind spot.

Publ: Bulletin Virginia Department of Highways and Transportation v45 n2 p13, 32 (Feb 1979)  
1979

Availability: See publication

HS-025 835

## TRANSPORTATION ISSUES

This study, based on the General Accounting Office's (GAO) plan for audit work of Federal transportation agencies and programs, presents a perspective on current and future transportation issues, by providing the background and analytical framework for identifying the major transportation programs, and problems to be addressed by GAO. Eight major transportation issues on which GAO will focus over the next two years are analyzed and recent GAO work in each area summarized. These issues include: developing and coordinating balanced national transportation policies and programs; restructuring and rehabilitating the railroad freight transportation system; developing a safe motor vehicle-highway transportation system; developing and maintaining an adequate and cost-effective national highway system; determining the continued justification for and effectiveness of surface transportation economic regulation; developing economically viable urban public transit systems; determining the role of intercity rail passenger service in the U.S. transportation system; and developing a safe, efficient, and reliable air transportation system. Emphasis is placed on Congressional interests and potential Congressional needs for GAO assistance. An appendix presents an overview of major government agencies, Congressional committees, private-sector lobby groups, and research organizations involved in transportation.

General Accounting Office, Community and Economic Devel. Div., Washington, D.C. 20548  
Rept. No. CED-78-159; 1978; 75p refs  
Availability: Corporate author

HS-025 837

## MICHIGAN DRIVER PROFILE. SOME BASIC FACTS ABOUT THE TRAFFIC CONVICTION AND ACCIDENT RECORDS OF MICHIGAN DRIVERS

This booklet summarizes the results of a comprehensive study which examined Michigan Dept. of State records in order to develop a profile of the state's drivers. It is the first of a number of publications which will examine the point system and other programs intended to identify and assist drivers with

problems. Profiles are based on the driving records of a randomly-selected 1% sample of all Michigan drivers, representing 60,554 drivers. Profiles present percentages of drivers falling into categories defined by characteristics available in the driving records. Some profiles show the age, sex, and regional distribution of drivers; others show the distribution of driving-related incidents, such as accidents, alcohol involvement, and traffic convictions and the points they carry.

Michigan Dept. of State, Office of Prog. Analysis, Lansing, Mich. 48918  
1978; 63p

Prepared in cooperation with Univ. of Michigan, Hwy. Safety Res. Inst.

Availability: Corporate author

HS-025 838

## SYSTEMS ANALYSIS OF ROAD TRAFFIC (ABBREVIATED VERSION OF INTERNRAPPORT NO. 160)

A systems analysis approach to obtain information on the traffic process, particularly the rural traffic process, in order to optimize the road traffic system, is outlined, (as part of a long-term project by the National Road and Traffic Res. Inst. of Sweden). The approach is to regard the traffic system as part of a control system, consisting of an administrative unit with its inherent decision-making process and a related information system. In principle, the approach enables an optimization of the road traffic system in terms of transport quality (i.e. level of service). The traffic system is the transfer function between input and output. The input of the controlled traffic system consists of operational measures (e.g. road factors such as cross section, alignment; traffic regulations; vehicle and driver characteristics), and strategic measures (e.g. resources and transportation need and demand which influence traffic volume and composition). The output of the traffic system are the measures of effectiveness describing the quality of the traffic process (e.g. operational costs such as journey time, fuel consumption, traffic safety). The simulation technique, the only feasible method to describe the traffic process, has been applied in the analysis of road improvements in the European road network (in particular, roads in Sweden and the U.K.) and is continuing to be developed in such applications. After the systems analysis, a road traffic simulation model is to be developed, as well as equipment for field studies to collect traffic data, including an integrated data processing system for validation of the simulation model. The simulation technique is to be applied and implemented in the decision process.

by Gosta Gynnerstedt  
Statens vag- och trafikinstitut (VTI), Fack, 58101 Linköping, Sweden  
Rept. No. VTI-44; 1977; 24p  
See also HS-025 826 (VTI-143), and HS-025 839 (VTI-43).  
Availability: Corporate author

HS-025 839

## A MODEL FOR THE MONTE CARLO SIMULATION OF TRAFFIC FLOW ALONG TWO-LANE SINGLE-CARRIAGEWAY RURAL ROADS

As part of a long-term research project by the National Road and Traffic Res. Inst. of Sweden regarding optimization of the

level of service of the rural road network, a model has been developed for the simulation of traffic flow on two-lane, rural roads. The model assumes that each vehicle on the roadway has a basic desired speed at which it would like to travel, but usually is prevented from doing so by the road geometry, and/or speed limit, and the presence of other vehicles on the road. The simulation model is described in terms of the effects of these factors individually and in combination, the input data, various results and analyses which can be obtained as output, calibration of submodels vs. observed data, continuing validation of the various submodels, and past and proposed future applications of the model. A brief description of the equipment used to collect the vehicle data used in the calibration and validation processes is appended.

by Gosta Gynnerstedt; Arne Carlsson; Bengt Westerlund  
Statens vag- och trafikinstitut (VTI), Fack, 58101 Linköping, Sweden  
Rept. No. VTI-43; 1977; 70p  
See also HS-025 826 (VTI-143), and HS-025 838 (VTI-44).  
Availability: Corporate author

HS-025 840

### **MOTOR VEHICLE STATISTICS. 1977 ACCIDENT AND OPERATIONAL STATISTICAL DATA. STATE OF NEW YORK DEPARTMENT OF MOTOR VEHICLES**

Motor vehicle statistical data for 1977 are compiled for the State of New York in two sections, one devoted to accident-related data, the other to frequently-requested data on New York State Dept. of Motor Vehicles programs and activities. Accident statistics include the following: 1976-1977 accident data comparison; ten-year accident summary 1968-1977; death and injury accident rates; age and sex distribution of persons killed and injured; seriousness of injury; manner of collision (two-vehicle accidents); pre-accident vehicle action and location of collisions; characteristics of drivers involved in accidents; road, light, and weather factors; accidents by hour of day and day of week; accident involvement by type of motor vehicle; age and sex distribution of pedestrians killed and injured; pedestrian actions and accidents by time of day and day of week; motorcycle and bicycle accidents (five-year summary and figures for 1977); summaries of motor vehicle accidents (MV-144A) Jan-Dec 1977, statewide and in New York City, and accidents involving pedestrians, motorcycles, bicycles, and school buses; and county accident data. In 1977, 974 reportable accidents occurred in New York every day, 54% of which resulted in death or injury. One vehicle out of every 13, and 1 driver out of every 15 was involved in an accident. One person was killed every 3 1/2 hours; 7 persons were killed every day. Thirty-two persons were injured every hour; 770 persons were injured every day. Operational statistics relate to motor vehicle licenses and registrations, convictions, suspensions and revocations, vehicle and driver safety programs, and motorboat and snowmobile registrations.

by Joan A. Schuff, ed.  
New York State Dept. of Motor Vehicles, Empire State Plaza, Albany, N.Y. 12228  
Rept. No. RD-20-(11/78); 1978; 70p  
Availability: Corporate author

HS-025 841

### **TARGET: HIGHWAY RISKS. 1. TAKING INDIVIDUAL AIM**

In this fifth in a series of articles on hazard assessment and management prepared by the Clark Univ. Hazard Assessment Group, the risk of being killed in a motor vehicle accident and how to reduce the risk are discussed. The variation of risk is discussed in terms of international comparisons, long-term trends in the U.S., state-by-state variation, and other correlates of highway mortality (time of day or week, accident type, age, sex, roadway type, and vehicle type). It is pointed out that a large fraction of highway fatalities are, in principle, preventable. A possible prescription for individual risk reduction is outlined (avoid alcohol and certain other drugs before driving, use seat belts at all times, avoid driving at night (particularly on Friday or Saturday), avoid the use of motorcycles and bicycles on major streets and roads, choose a woman over a man to drive (all other things equal) and a middle-aged man over a young man, opt for turnpikes and interstates, and choose a large over a small car). Consideration is given to some of the more significant aspects of the physical theory underlying highway collision losses: the role of acceleration, frontal barrier crashes, multivehicle crashes, and passenger restraints. Vehicle and highway design criteria, based on the physics of crashing, are outlined. The use of cost-effectiveness studies in the setting of vehicle and highway standards is discussed. It is stated that the overall gains from highway design improvement are substantial; in contrast, only modest progress has been made in vehicle design, although the Dept. of Transportation's Experimental Safety Vehicle Prog. indicates that engineers have solved many of the problems raised by conflicting design criteria. It is felt that the highway fatality problem continues, not for lack of scientific knowledge but because of the multiple ways the automobile is embedded in the society, economy, bureaucracy, and in individual activities and attitudes.

by Thomas Bick; Christoph Hohenemser  
NSF-ENV-77-15334  
Publ: Environment v21 n1 p16-20, 37-40 (Jan-Feb 1979)  
1979; 14refs  
Availability: See publication

HS-025 842

### **THE ALUMINUM-AIR BATTERY FOR ELECTRIC VEHICLES**

Lawrence Livermore Lab. is currently assessing an attractive candidate for energy storage for electric vehicles, i.e. the aluminum-air battery. The concept for the battery couples an extremely high specific energy that could conceivably provide a range of 1600 km with rapid mechanical refueling (on the order of minutes). The battery's life-cycle costs are projected to be close to those of the internal combustion engine. Adding a small flywheel to the aluminum-air power system would enhance both the battery's efficiency and the vehicle's market appeal. The flywheel/battery vehicle could match the range, acceleration, top speed, and rapid refueling capability of today's gasoline-powered vehicles. The development program for the battery includes system studies to determine optimal operating conditions for given vehicle specifications and to assess the power cell's technical and economic feasibility for transportation. Also underway are electrochemical studies of

the electrodes and the design of processes to control electrolyte composition during discharge.

Publ: Energy and Technology Review p25-32 (Nov 1978)

1978; 8refs

Based on article by John F. Cooper and E. L. LiHauer (see Ref. 1).

Availability: See publication

HS-025 843

### **BIG BROTHER IS STEPPING ON YOUR HEAD. [MOTORCYCLE SAFETY AND HELMET USAGE]**

Available information is presented concerning the effort recently launched by the National Hwy. Traffic Safety Administration (NHTSA) to make motorcycle helmet use mandatory nationwide. The latest press conference address (11 Jan 1979) by Joan Claybrook, the Administratrix of NHTSA, is presented verbatim; the release is announced of a report summarizing the results of five recent NHTSA studies whose results demonstrated the positive effects of helmets and helmet usage laws on highway safety. The preliminary report (prepared by NHTSA's National Center for Statistics and Analysis) is presented of a study being conducted by the Univ. of Southern California (USC) on 1976-1978 motorcycle accidents in the Los Angeles area. Key findings to date of the USC study, to be completed late in 1979, are based on an analysis of 899 on-scene, in-depth motorcycle accident investigations; the findings reconfirm that dramatic gains in motorcycle safety can be achieved if motorcyclists wear helmets and if they and their cycles are made as conspicuous as possible. A position paper from the American Motorcycle Assoc. (AMA) on NHTSA's desire to reinstate mandatory helmet laws contends that NHTSA's recent studies on motorcycle safety and helmet usage laws suggest that the studies were undertaken with a preconceived outcome, that the results point to a very selective use of data with complete disregard for conflicting information, and that the final injury countermeasure recommendation (mandatory helmet laws) is not warranted and is a distortion of the joint priorities in the studies. Cycle News contributing editor, Mary Grothe, briefly presents her views on the press conference and on a subsequent meeting to announce the USC continuing study; she expresses the belief that arguments by motorcycle groups (e.g. AMA, Motorcycle Safety Foundation) against motorcycle legislation are very weak, and that NHTSA's statistics cannot be disproved if the motorcycle organizations do not have enough of their own data.

Publ: Cycle News - West v16 n5 p12-4, 37 (14 Feb 1979)  
1979

Outsize pages.

Availability: See publication

HS-025 844

### **HIGHWAY CAPACITY, MEASURES OF EFFECTIVENESS, AND FLOW THEORY**

Ten articles (some including discussion and author closure) on highway capacity and flow separately consider the following topics: the Swedish Road Administration traffic capacity manual, weighing vehicles in motion, estimation of left-turn saturation flows, signal cycle length and fuel consumption and emissions, traffic conflicts as a diagnostic tool in highway safety, design considerations of traffic conflict surveys, traffic

conflict and collision analysis, evaluating highway guide signing (abridged), macroscopic simulation models for use in traffic systems management (abridged), and some properties of freeway density as a continuous-time, stochastic process.

Transportation Res. Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418

Rept. No. TRR-667; 1978; 90p refs

Includes HS-025 845-HS-025 852.

Availability: TRB \$5.00

HS-025 845

### **SWEDISH CAPACITY MANUAL. PT. 1. OBJECTIVES, SCOPE, AND ARRANGEMENT OF THE MANUAL. PT. 2. CAPACITY OF UNSIGNALIZED INTERSECTIONS. PT. 3. CAPACITY OF SIGNALIZED INTERSECTIONS**

The new (1977) Swedish Road Administration traffic capacity manual is described in three parts, each by the individual author, followed by discussions of each part. The first part gives an overview of the objectives, scope, and arrangement of the manual; the second part presents the theoretical developments, field studies, and recommended methods for improving the efficiency of unsignalized intersections; the third part deals with the same aspects for signalized intersections. The manual treats motor vehicle traffic, bicycle traffic, and pedestrians. The main efficiency factors are capacity, queue length, delay, and proportion of stopped vehicles. Explanatory models based on the queue theory of motorist behavior have been chosen to limit the empirical evidence to parameters such as critical-time headway. The main new types of facilities covered in the manual are unsignalized intersections, including traffic circles, and bicycle and pedestrian facilities. For signal-controlled intersections, new developments have been made for left-turning traffic with opposing conflict, right-turning traffic with pedestrian conflict, various lane divisions, and calculation of cycle length. The calculation of different measures of efficiency has been systematized. The methods are reported as a series of steps in a computation.

by Bo E. Peterson; Arne Hansson; Karl-Lennart Bang  
National Swedish Road Administration; Vattenbyggnadsbyran (VBB), Malmo, Sweden; Swedish Transport Res. Commission  
Publ: HS-025 844 (TRR-667), "Highway Capacity, Measures of Effectiveness, and Flow Theory," Washington, D.C., 1978 p1-28

1978; 22refs

Availability: In HS-025 844

HS-025 846

### **WEIGHING VEHICLES IN MOTION**

A scale for weighing vehicles in motion is described in terms of its development and evaluation. (Discussions and authors' closure follow.) The scale utilizes the hydraulic pressure principle. Loads applied to any point on the load platform are transmitted evenly around the perimeter of the platform by four torsion arms. The load platform can move only vertically as a rigid unit. This vertical motion is extremely small, i.e. in the order of 0.015 cm (0.006 in) at 4500 kg (10,000 lb), and is nearly frictionless due to the roller pad contacts between the load platform, the torsion bars, and the support frame. The entire load is then supported by a single, centrally-located load cell, an oil-filled piston cylinder arrangement with a strain



gauge transducer. The scale was operated unmanned at two locations in Saskatchewan (Canada) during 1975 and 1976. This preliminary testing and evaluation revealed that the scale is capable of weighing vehicles in motion with sufficient accuracy to meet the information requirements of pavement and bridge engineers, and is rugged and reliable enough to be operated on a continuous, unmanned basis in the harsh Canadian environment. An expanded evaluation program to include locations in Ontario, Quebec, and New Brunswick was undertaken in 1977 by a project committee of the Roads and Transportation Assoc. of Canada.

by A. T. Bergan; G. A. Sparks; G. Dyck  
University of Saskatchewan, Coll. of Engineering, Saskatoon, Sask., Canada  
Publ: HS-025 844 (TRR-667), "Highway Capacity, Measures of Effectiveness, and Flow Theory," Washington, D.C., 1978  
p28-34  
1978; 11refs  
Availability: In HS-025 844

HS-025 847

### ESTIMATION OF LEFT-TURN SATURATION FLOWS

The best known methods for estimating left-turn saturation flow at intersections (Tanner; Webster; Drew; Fambro, Messer, Anderson; Highway Capacity Manual; Australian Road Capacity Guide) were tested for reliability against field data (some 4000 left-turn movements at five different intersections in upstate New York recorded by time-lapse photography). The situation under consideration is left-turning traffic flowing through gaps of suitable size in the opposing traffic without the protection of a special signal phase. Both one and two lanes of opposing traffic were considered, as were unsignalized intersections. Data also were examined to determine the distribution of gap sizes accepted by left turners confronted with opposing traffic. Gap-acceptance functions were derived by allowing the estimation of the percentage of drivers accepting a gap of a particular size. Statistical analysis showed that most of the original models are unsatisfactory for predicting the saturated conditions observed in the field. Drew's equation, when used at signalized intersections with two opposing lanes, provides a very reliable estimate, and the Australian method is fairly satisfactory for signalized intersections with one opposing lane and unsignalized intersections with two opposing lanes. None of the models is satisfactory for an unsignalized intersection with one opposing lane. Adjustments to the models to better reflect real-world conditions improved the models but not satisfactorily for some cases. For this reason, a new model was developed for each type of intersection studied. From the gap-acceptance study, it is concluded that cumulative accepted gaps are uniformly distributed over the range of permissible sizes.

by Panos G. Michalopoulos; Jerome O'Connor; Sergio M. Novoa  
Rensselaer Polytechnic Inst., Troy, N.Y.; Catholic Univ. of Valparaiso, Chile  
Publ: HS-025 844 (TRR-667), "Highway Capacity, Measures of Effectiveness, and Flow Theory," Washington, D.C., 1978  
p35-41  
1978; 9refs  
Sponsored by Com. on Hwy. Capacity and Quality of Service.  
Availability: In HS-025 844

HS-025 848

### SIGNAL CYCLE LENGTH AND FUEL CONSUMPTION AND EMISSIONS

A microscopic network simulation model (NETSIM, form UTCS-1) was used to evaluate the relationship between consumption and signal cycle length. A single intersection simulated for three scenarios having different volumes left- and right-turn percentages on each approach of the intersection. One result of the study, which differs from that of other researchers (Bauer; Courage and Parapar), is that cycle length that minimizes delay also minimizes fuel consumption and hydrocarbon and carbon monoxide emissions. This discrepancy probably results from the fact that NETSIM's microscopic logic automatically includes the fuel consumption increment due to cars that slow down but do not stop, as well as accounting for the effect of multiple stops to left turns. Another finding of interest is a variance of Webster's expression that predicts that number of stops decreases as the cycle length increases. The discrepancy probably the result of different assumptions, e.g. constant arrivals and departures in Webster's model vs. random arrivals and departures with the NETSIM model. A regression analysis was performed to examine relationships between vehicle average speed and fuel consumption and emissions. It was found that there is a strong correlation between these measures but that the relationships are not linear.

by Stephen L. Cohen; Gary Euler  
Federal Hwy. Administration, Office of Res., Washington, D.C. 20590  
Publ: HS-025 844 (TRR-667), "Highway Capacity, Measure of Effectiveness, and Flow Theory," Washington, D.C., 1978  
p41-8  
1978; 15refs  
Sponsored by Com. on Methodology for Evaluating Hwy. Improvements.  
Availability: In HS-025 844

HS-025 849

### TRAFFIC CONFLICTS AS A DIAGNOSTIC TOOL FOR HIGHWAY SAFETY

Various studies are reported by the Kentucky Dept. of Transportation to identify and evaluate high-accident sites. (discussion follows.) To test the reliability of accident data in predicting future accidents at a location, an analysis was made of 60 intersections in central Kentucky. The number of accidents for a given year vs. the number for the following year resulted in a correlation coefficient (r-value) of only 0.64. A similar analysis for 170 rural spot locations resulted in a value of 0.59. In view of the usefulness of accident data was complemented by traffic conflict data, an effort was made to gain a better understanding of traffic conflicts. Conflict counts were conducted at five intersections in central Kentucky using the General Motors (GM) procedure for identifying and recording conflicts at intersections. Traffic events were classified in terms of increasing severity. Accident data recorded only the last three links (property damage, injury, fatal) while traffic counts provide the others (traffic volumes, minor conflicts, moderate conflicts and erratic maneuvers, severe conflicts or near misses, and minor collisions, usually not reported). Good reliability was found between observed simultaneous counts of conflicts and weaves with r values as high as 0.93. Only 37% of the variance in conflicts was determined to be associated with traffic volume. Observation



one moderately high-volume intersection revealed that conflict numbers and types were similar for each of two days (11 hr/day data collection). A revised GM procedure was developed for use in Kentucky; several modifications were made in data collection (times, conflict categories). Several evaluations of safety improvements have been completed in Kentucky in recent years in terms of both accidents and conflicts. Reductions in conflicts and accidents have resulted from such improvements as installing left-turn signal phasing, raised pavement markers, and green-extension systems. Based on the successful use of conflict and erratic maneuver data in Kentucky since 1972, increased use of such data on a routine basis is recommended.

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Publ: HS-025 844 (TRR-667), "Highway Capacity, Measures of Effectiveness, and Flow Theory," Washington, D.C., 1978  
p48-57  
1978; 8refs  
Sponsored by Com. on Methodology for Evaluating Hwy. Improvements.  
Availability: In HS-025 844

HS-025 850

### DESIGN CONSIDERATIONS OF TRAFFIC CONFLICT SURVEYS

The traffic conflicts technique for indirectly measuring safety is discussed in terms of accuracy and dependence on the design of the field survey. (A discussion and author's closure follow.) Current practices in conflict-count duration are reviewed, and the relationship between count duration and estimation accuracy is examined. Using data from several sources, the daily variability of conflict counts is described. It is concluded that the expected conflict rate varies from day to day. Use of negative binomial distribution is suggested as appropriate for representing the distribution of sample means obtained from conflict studies. On this basis, confidence limits and probabilities of type I and type II errors in hypothesis testing are obtained and tabulated. Their use in study design is illustrated by numerical examples. The marginal increase in estimation accuracy diminishes rapidly as conflict-counting time increases; there is little to be gained by counting longer than three days. This establishes a practical limit to the accuracy with which expected daily conflict rates can be estimated.

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Publ: HS-025 844 (TRR-667), "Highway Capacity, Measures of Effectiveness, and Flow Theory," Washington, D.C., 1978  
p57-66  
1978; 15refs  
Sponsored by National Res. Council of Canada, and Transport and Road Res. Lab. (England).  
Availability: In HS-025 844

HS-025 851

### ANALYSIS OF TRAFFIC CONFLICTS AND COLLISIONS

Results are reported of a two-year study which investigated parameters intrinsic to the sequence of events leading to vehicle collisions and traffic conflicts in an attempt to develop a

more practical and reliable application of the traffic conflicts technique (TCT). (A discussion and authors' closure follow.) The TCT, introduced by General Motors, defines a traffic conflict in a way that includes visible evasive actions taken by drivers and the occurrence of traffic violations. It suggests that evasive actions be identified by brake lights or lane changes. In the present study, sequences of collisions and conflict events were videotaped and analyzed in detail. Preliminary investigations have revealed that using the common method of brake application is not adequate for describing conflict. As a result, several methods of defining a conflict situation have been developed. The proportion of stopping distance (PSD) is defined as the ratio of the distance available for a driver to maneuver to the distance remaining to the projected location of collision. A measure of gap time (GT) indicates the duration of time between the end of encroachment by the left-turning vehicle on the through lane and the expected arrival of the through vehicle at the potential point of collision. Encroachment time (ET) is defined simply as the time during which the left-turning vehicle infringes upon the right-of-way of the through vehicle. The deceleration rate (DR) is an event that occurs during the intermediate stage of a traffic conflict and can be interpreted as indicative of the severity of the situation. Post encroachment time (PET) for a conflict is identified as the time from the end of encroachment to the time that the through vehicle actually arrives at a potential point of collision. Initially attempted post encroachment time (IAPE) is another conflict measurement. It is concluded after an evaluation of the TCT measurements, that at least two of the proposed methods (PET, DR) will provide practical investigative tools.

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Publ: HS-025 844 (TRR-667), "Highway Capacity, Measures of Effectiveness, and Flow Theory," Washington, D.C., 1978  
p67-74  
1978; 8refs  
Sponsored by Transport Canada.  
Availability: In HS-025 844

HS-025 852

### SOME PROPERTIES OF FREEWAY DENSITY AS A CONTINUOUS-TIME, STOCHASTIC PROCESS

Traffic density is viewed as a continuous-time, stochastic process, and consideration is given to some of the characteristics of that process. Freeway traffic data previously obtained by sequential aerial photography are utilized. Position data were smoothed and interpolated to construct individual trajectories, which were aggregated to obtain continuous vehicle counts in roadway sections of various lengths. Autocorrelation functions and power spectra were calculated for these records. It was found that, for the traffic flow under consideration, correlation time was proportional to freeway section length. The power in the process was concentrated below a cutoff frequency that was related inversely to section length.

HS-025 853

HSL 79-

The implications of these results for sampling real traffic processes are discussed.

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Publ: HS-025 844 (TRR-667), "Highway Capacity, Measures of Effectiveness, and Flow Theory," Washington, D.C., 1978 p79-83  
1978; 20refs  
Sponsored by Com. on Traffic Flow Theory and Characteristics.  
Availability: In HS-025 844

HS-025 853

### HOW TO BREAK IN A NEW BIKE [MOTORCYCLES]

Tips are provided for the new-motorcycle owner to operate his bike properly during early mileage so that its life will be lengthened. The components that benefit most from break-in are the pistons, piston rings, and cylinders. Until they have worn off their roughness and developed adequate working clearance, they will generate considerable friction. In some engines, the pistons may be a press fit. If they expand too much from overwork, the pistons can distort and squeeze through the oil film separating them from the cylinder walls; tiny bits of aluminum are torn loose from the pistons' high spots and lodge on the cylinder walls. It is necessary not to abuse a new engine nor to allow it to overheat. The bike should be operated in a medium rpm range. Cruising rpm limits can be exceeded for brief periods of time. An occasional spurt of speed above cruising rpm followed by closing the throttle and coasting will break in the new engine faster and more effectively. Engine speed is more critical than ground speed. If there is no tachometer on the cycle, the operator can listen carefully to the engine to determine its operating condition. The engine also must be given progressively more work to do as the mileage accumulates. Other aspects of break-in include lubrication (proper oil levels, first oil change by 200 mi or 300 mi, oil change at 500 mi for separate gearbox oil supply and fork oil, no use of oil additives during break-in); tightening of fasteners; adjustment of various components, such as rear chain, clutch, and valves (four-stroke engine); and use of moderate braking pressure for first few miles and avoidance of riding the brakes.

by Bill Hampton  
Publ: Popular Mechanics v151 n4 p72, 209-10 (Apr 1979)  
1979  
Availability: See publication

HS-025 854

### ESTIMATES OF FUEL SAVINGS THROUGH IMPROVED TRAFFIC FLOW IN SEVEN U.S. CITIES

A study was undertaken to estimate fuel savings obtainable by improvements in traffic flow in specific major metropolitan areas (Chicago, Denver, Detroit, Los Angeles, New York, San Francisco, and Washington, D.C.), utilizing the Chase Car data collected by the General Motors Proving Ground which consist of speed profiles from randomly-selected car trips. These data permit calculation of fuel consumption estimates for average speeds represented in the data and for hypothetical variations in these speeds that could represent the results of traffic flow improvements. Two flow-improvement assumptions explored were raising the average speeds of all trips that have average

speeds below a specified minimum speed to that minimum speed, and raising the average speeds of trips with average speeds less than 64 kph to a speed equivalent to driving at speed limit on all road segments. The Chase Car data indicate that the potential for fuel savings through traffic flow improvements depends primarily upon the metropolitan area; only secondarily upon the time of day. It was generally estimated that increasing average speeds of all trips in the seven cities to at least 24 kph, for example, could result in fuel savings up to 2.5%. It was also estimated that if all trip speeds in the cities were raised to the speed limit or to a maximum of 64 kph, whichever is lower, fuel savings would be approximately 15%.

by Man-Feng Chang; Alan J. Horowitz  
Publ: Traffic Engineering and Control v20 n2 p62-5 (Feb 1979); 11refs  
Availability: See publication

HS-025 855

### NHTSA [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] CALLS IT 'NEWS' BUT IT'S THE SAME OLD SONG [MANDATORY MOTORCYCLE HELMET USAGE]

In a recent press conference, NHTSA (National Hwy. Traffic Safety Administration) Administrator Joan Claybrook denounced the agency's renewed pressure on states to reenact mandatory motorcycle helmet usage laws, while releasing data from four new state helmet use studies preliminary findings of a major motorcycle accident study at the Univ. of Southern California (USC). Ms. Claybrook stated that the helmet use studies from Oklahoma, Kansas, South Dakota, and Colorado, where helmet laws were repealed, show conclusively that helmets are effective in preventing head injuries and deaths, and that mandatory helmet laws are effective in getting cyclists to wear helmets. American Motorcycle Assoc.'s Government Relations Director Ed Youngblood, who attended the conference, states that injury-reduction and increased-usage effects are not in correlation, but that NHTSA ignores the opinions of motorcyclists who favor voluntary use. Ms. Claybrook did not address the fact that fatalities increased in 17 states with mandatory helmet laws in a period comparable with the repeal states' study, that 9 of 10 highest fatality rates occur in states with helmet laws and that there is a high level of voluntary helmet use in repeal states. Mr. Youngblood points out that the initial findings of the USC study indicate that the motorcycle safety problem results from causes that helmets do not influence. He suggests that NHTSA discontinue its unpopular stand on mandatory helmet laws and devote more energy to better licensing and education programs.

Publ: American Motorcyclist v33 n3 p27 (Apr 1979)  
1979  
Availability: See publication

HS-803 543

### TECHNOLOGICAL CHANGE IN U.S. AUTOMOBILE INDUSTRY: ASSESSING PAST FEDERAL INITIATIVES. FINAL REPORT

It is argued that there are at least two other dimensions of government intervention in industrial activity other than regulation, viz. technology creation action and market modification.

action. The former, which seeks to induce change through the creation of superior new technologies, is designated as "technology push" intervention. Market modification action and regulation (which really is a part of a more generic intervention called "product characteristic intervention") seek to induce producers to create new products or modify existing ones. This process is termed "technology pull". Technology push and technology pull are independent but complementary actions; differing balances between the two has major significance for the nature and rate of technological innovation. A framework is presented relating combinations of the actions to their joint consequence for technological innovation. The pattern of past Federal initiatives in the auto industry (i.e. emission control, safety, fuel economy) and the effect of these initiatives on automotive performance are studied. The initiatives and response to them are explained in terms of the framework. It is suggested that the present mix of Federal initiatives can entrench technology, and that should radical innovation be desired in the industry, a different set of Federal initiatives would be required. It is suggested that in order to induce innovation, both a stronger Federal commitment to research and development programs and positive steps in creating incentives that are appropriate for innovative products are needed.

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DOT-TSC-1355

Rept. No. DOT-TSC-NHTSA-79-13; 1979; 103p 42refs

Rept. for Jun 1977-May 1978.

Availability: NTIS

HS-803 545

## THE NATIONAL DRIVER REGISTER PROGRAM USERS' GUIDE

The National Driver Register (NDR), a nationwide repository of information on problem drivers which complements the driver licensing operations of the 56 states and territories, is described. The NDR, a program of the National Hwy. Traffic Safety Administration, is a central contact point for Federal, state, and territorial authorities in their efforts to ascertain problem drivers applying for original or renewal licenses. Descriptions are given of the operation of the NDR (file check related to a license application), the NDR product (Report of Inquiry Searched), delayed search, routing codes for search requests, preparation of NDR data, privacy requirements, availability of records, request for records, locations of records, and request to correct or alter records. Appended are Public Law 89-563, 80 Stat. 730, Title IV--National Driver Register (expansion of original authority of NDR), magnetic tape record formatting instructions used in request for file check and report of license withdrawal/denial, abridged listing of American Assoc. of Motor Vehicle Administration codes used by NDR for recording driver license denials/withdrawals, state identification codes and abbreviations, Federal department and agency identification codes, driver eye color code, and data elements required by NDR in making privacy file checks. A glossary is provided.

National Hwy. Traffic Safety Administration, Washington,  
D.C. 20590

1978; 35p refs

Availability: GPO

HS-803 680

## IMPACT OF MOTORCYCLE HELMET USAGE IN COLORADO. FINAL REPORT

A study was undertaken to assess the postcrash injury consequences to motorcycle drivers and passengers in Colorado, in particular to compare the differences in frequency, severity, and location of injuries sustained by riders wearing a safety helmet and by helmetless riders. The study also sought to assess the impact of the repeal of the mandatory helmet usage law in Colorado on helmet use throughout the state. Data collection took place during Jul-Sep 1976 (pre-repeal data) and during those same months of 1977 (post-repeal data). Findings pertaining to injury consequences were derived from in-depth medical evaluations of 1700 motorcycle riders involved in accidents during both time periods. The Abbreviated Injury Scale was used by medical personnel to standardize injury data. Rates of occurrence of both fatal and critical injuries to riders were found to increase substantially from the pre-repeal to the post-repeal period, occurrence rates of these two groups of injuries to riders were considerably less for helmeted vs. nonhelmeted riders, rates of injury occurrence to the head, neck, and face were influenced significantly by helmet use (far lower rate for all three sites among helmet wearers), and the severity of head injuries was significantly greater for helmetless vs. helmeted riders. Findings concerning helmet usage are based on roadside observations, at randomly-selected sites, of 16,000 riders for 1976 and of 24,500 riders for 1977. Among the findings are that helmet use in Colorado prior to repeal of the law approached perfect compliance (99% helmet use), that subsequent to repeal, use of helmets dropped to 58%, and that after repeal, the highest rate of helmet use (72%) was on rural freeways, the lowest (47%), on urban, four-lane streets.

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DOT-HS-6-01429

Rept. No. 403-2-A; 1978; 382p 12refs

Rept. for Jul-Sep 1976 and Jul-Sep 1977.

Availability: NTIS

HS-803 722

## AN ASSESSMENT OF THE POTENTIAL IMPACT OF COMBUSTION RESEARCH ON INTERNAL COMBUSTION ENGINE EMISSION AND FUEL CONSUMPTION. FINAL REPORT

A review is presented of the present level of understanding of the basic thermodynamic, fluid dynamic, and chemical kinetic processes which affect the fuel economy and levels of pollutant exhaust products of diesel, stratified-charge, and spark-ignition (SI) engines. The major factors which control fuel consumption and pollutant emissions are reviewed, and it is indicated, in a general way, how these factors interact for each of the major engine types. In a similar way, the competitive position of the diesel and the stratified-charge engines relative to the carbureted (homogeneous) SI engine is discussed. Technology transfer from gas turbine combustion systems to heterogeneous combustion piston engines is considered. Areas which appear to offer substantial returns for research investment, either in reduced fuel consumption, reduced emissions, or both, are indicated. The ability to operate under lean burn conditions, providing higher fuel economy and lower nitrogen oxides emissions, would seem to bias future research and development efforts for light-duty vehicle engines in favor of

heterogeneous (diesel or stratified-charge) engines. These potential benefits must be weighed against the fact that current models of heterogeneous systems produce high levels of exhaust emissions due to incompletely-combusted fuel (and lubricating oil). These emissions include carbon monoxide (CO), soot, polycyclic aromatic hydrocarbons (PAH's), malodors, light aromatics, and aldehydes. Each of these emission types poses potentially serious health or environmental problems. Heterogeneous engines have the theoretical capability of completely oxidizing all fuel (and entrained lubricating oil) to carbon dioxide and water. The challenge is to achieve this result more nearly in practice. The major impediment to controlling and improving CO and incompletely-burned hydrocarbon emission levels is the lack of understanding of the fluid mixing processes which control combustion in heterogeneous systems. A second set of challenges involves the elucidation of chemical mechanisms and rates which control the formation and destruction of complex, incompletely-burned emissions.

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DOT-TSC-1487  
Rept. No. ARI-RR-131; DOT-TSC-NHTSA-78-47; 1979; 92p  
82refs  
Rept. for Dec 1977-Apr 1978.  
Availability: NTIS

HS-803 783

#### **IMPACT TEST OF COMPACT VEHICLE WITH MODIFIED SIDE STRUCTURE, 35 MPH, 60 DEGREE IMPACT, TORINO-TO-VOLARE, TEST NO. 5. FINAL REPORT**

Results are presented for the fifth of 11 tests conducted to investigate and improve crashworthiness of compact vehicle side structures. Run at 35 mph at a striking angle of 60 degrees, the test involved a 1975 Ford Torino as the bullet vehicle and a modified 1976 Plymouth Volare as the target vehicle. Volare modifications included a heavier door beam, stronger beam-to-door connections, and tying the door structure into the sill. The modified vehicle showed significant improvement in intrusion and door velocity as compared to baseline tests. Provided are a crash test summary, before and after photographs, camera location information, diagram of intrusion-measurement locations, interior and exterior damage measurements, instrumentation summary, dummy injury criteria values, and electronic data.

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Dynamic Science, Inc., 1850 W. Pinnacle Peak Rd., Phoenix,  
Ariz. 85027  
DOT-HS-5-01104  
1979; 62p  
Rept. for Jun 1976-Mar 1978. See also HS-803 788.  
Availability: NTIS

HS-803 788

#### **IMPACT TEST OF COMPACT VEHICLE WITH MODIFIED SIDE STRUCTURE, 35 MPH, 60 DEGREE**

#### **IMPACT, IMPALA-TO-VOLARE, TEST NO. 10. FINAL REPORT**

Results are presented for the tenth of 11 tests conducted to investigate and improve crashworthiness of compact vehicle structures. Run at 35 mph at a striking angle of 60 degrees, test involved a 1978 Chevrolet Impala as the bullet vehicle and a modified 1976 Plymouth Volare as the target vehicle. Volare modifications included a heavier door beam, stronger beam-to-door connections, and tying the door structure into the sill. The modified vehicle showed significant improvement in intrusion and door velocity as compared to baseline tests. Provided are a crash test summary, before and after photographs, camera location information, diagram of intrusion-measurement locations, interior and exterior damage measurements, instrumentation summary, dummy injury criteria values, and electronic data.

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Dynamic Science, Inc., 1850 W. Pinnacle Peak Rd., Phoenix,  
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DOT-HS-5-01104  
1979; 81p  
Rept. for Jun 1976-Mar 1978. See also HS-803 783.  
Availability: NTIS

HS-803 791

#### **THE EFFECT OF MOTORCYCLE HELMET USAGE ON HEAD INJURIES, AND THE EFFECT OF USAGE LAWS ON HELMET WEARING RATES. A PRELIMINARY REPORT**

Data are summarized from the census of all fatal crashes maintained by the National Hwy. Traffic Safety Administration (NHTSA) in the Fatal Accident Reporting System, from NHTSA-sponsored studies. These studies include studies of safety helmets, a continuing, in-depth study of motorcycle accidents in Southern California, and four studies in states which repealed their mandatory helmet laws (Colorado, South Dakota, Kansas, and Oklahoma). An overview of some of the most significant findings is oriented to the evaluation of the impact of helmet wearing and the effectiveness of usage laws. The findings make a strong case for the efficacy of helmet use and helmet usage laws in reducing the incidence and severity of head injuries among crash-involved motorcyclists. Motorcyclists who do not use safety helmets have twice as many total head injuries and three to four times as many fatal head injuries as helmet wearers. In states with mandatory usage laws, helmet wearing is high (90% to 100%), but the usage rate falls rapidly to less than 60% following repeal of such laws. As a result of the reduction in helmet usage, the post-repeal total head injury rate per crash-involved rider rises and fatal head injury rate doubles. The detailed study of the 899 Calif. crashes indicated that hearing was very important to crash avoidance and, in any case, there was no evidence that the helmet interfered with hearing. The reduction of 3% in the field of vision produced by the standard helmet was not judged important, because most high-speed threats are more or less directly in front of the motorcyclist. In the same study, of over 980 head injuries, there were only four cases of minor injury attributed to the helmet and no head and neck injuries to 355 helmeted riders. In each of

October 31, 1979

HS-803 794

cases, a much more serious injury would have resulted had the helmet not been worn.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590  
1979; 16p 11refs  
Availability: Corporate author

HS-803 792

### **CALIBRATION OF THREE YEAR OLD CHILD DUMMIES (PHASE 2). FINAL REPORT**

Test procedures, equipment, and results are summarized, and test data are presented for a test program to refine previously developed appropriate calibration procedures for measuring the dynamic response of a three-year-old dummy using acceleration measurements. Chest impact, head/neck pendulum impact, and lumbar spine flexion tests were conducted. It is concluded that acceleration and force measurements can be used to determine the dynamic response of a three-year-old dummy. All tests gave repeatable data, but the chest impact test required care during the setup for each impact in order to obtain repeatable data. The head/neck pendulum test repeatability can be improved by first running practice tests to obtain the proper pendulum acceleration pulse shape; the aluminum honeycomb can be trimmed to produce the desired shape.

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Rept. No. NHTSA-OVSS-678-2; 1978; 222p  
Rept. for Jun-Sep 1978.  
Availability: NTIS

HS-803 793

### **DRIVER PERFORMANCE AND INDIVIDUAL DIFFERENCES IN ATTENTION AND INFORMATION PROCESSING. FINAL REPORT. VOL. 1: DRIVER INATTENTION**

The main part of an evaluative review is provided of existing knowledge in the fields of traffic safety, driver behavior, and psychology with respect to driver inattention. The review covers literature on driver behavior and traffic safety, human factors and experimental psychology in the fields of perception, cognition, and physiological psychology. The assessment of traffic accidents due to driver inattention was based on a review of published literature and some reanalysis of accident data statistics. The Indiana Univ. accident files were reanalyzed in order to identify the situational and personal characteristics associated with inattention-type accidents. The following information is presented: a discussion of basic concepts, theories, measurement techniques, and research paradigms in studies of attention and driver performance; a multidimensional definition of attentional performance in the context or driving behavior; an analysis of inattention-related traffic accidents; a survey of behavioral and psychological indicators of inattention; a survey of individual differences in attentional performance; a detailed delineation of unresolved research issues; and recommendations for future research aimed at developing driver-oriented inattention countermeasures. Research recommendations include the following: the role of driving experience (especially early) on the formation of habits of attentional performance; the trainability of attentional performance (especially looking behavior); size esti-

mates of potential target groups for countermeasures; stability of attentional performance indices; inattention-related criteria for selection of professional drivers; the potential of low-event, noninterfering subsidiary task as an alerting device for drivers; driver-coupled monitoring devices based on composites of physiological, looking-behavior, and performance indicators; and autoregulation of attentional performance.

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DOT-HS-8-01819  
Rept. No. DOT-HS-8-01819-78-DAP; 1978; 247p 190refs  
Rept. for Oct 1977-Nov 1978. Vol. 2, Field Dependence and Highway Safety, is HS-803 794.  
Availability: NTIS

HS-803 794

### **DRIVER PERFORMANCE AND INDIVIDUAL DIFFERENCES IN ATTENTION AND INFORMATION PROCESSING. FINAL REPORT. VOL. 2: FIELD DEPENDENCE AND HIGHWAY SAFETY**

As part of an evaluative review of existing knowledge in the fields of traffic safety, driver behavior, and psychology with respect to driver inattention, a detailed review of the research on the personality characteristic of field dependence as it relates to highway safety is provided. Field dependence was chosen for particular attention because of recent and apparently promising research results relating this characteristic to accident involvement. The first of two parts of the review is concerned with the nature of field dependence as a theoretical concept, its relationship to other measures of individual differences, and its methods of measurement. The second part deals with the relationship between field dependence and highway safety in terms of driving behavior and accident involvement. It is recommended that future research should replicate and extend the findings of field dependence and driver behavior to natural and typical driving situations. The research on the relationship of field dependence to accidents should focus on the class of accidents which theoretically could be attributed to behaviors associated with field dependence rather than on all accidents. Two areas of research suggest that a training program could be developed to improve the visual search pattern of field-dependent drivers. There is some evidence to indicate that performance on field dependence tests such as the Embedded Figures Test and the Rod and Frame Test can improve with practice. Field dependence appears to be correlated with eye movement patterns which are known to change with experience in driving. Some basic research is needed before a plausible hypothesis can be generated concerning the implications of field dependence for accident involvement and the potential for highway safety improvement through reduction of field dependence.

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DOT-HS-8-01819  
Rept. No. DOT-HS-8-01819-78-FD; 1978; 60p 54refs  
Rept. for Oct 1977-Nov 1978. Vol. 1, Driver Inattention, is HS-803 793.  
Availability: NTIS

HS-803 795

**DECRIMINALIZATION: ADMINISTRATIVE  
ADJUDICATION. VOL. 1: ANALYSIS AND FINDINGS  
[TRAFFIC OFFENSES]. FINAL REPORT**

Results are presented for a research study undertaken to compare the relative "fairness," "efficiency," and "effectiveness," of processes in the administrative adjudication of decriminalized traffic offenses in two geographic areas, Buffalo, N.Y. and the State of North Dakota, with traditional adjudication programs in similar geographic areas, Syracuse, N.Y. and the State of South Dakota, respectively. To accomplish this goal, information common to all areas was identified, collected and analyzed to determine possible significant differences in impact on a series of criterion measures, the type and degree of impact, and possible causative factors attributable to such differences. Results show that although the Buffalo Administrative Adjudication Bureau system operated more efficiently than the Syracuse traditional traffic court system, there was no difference in terms of fairness or highway safety impact. It is indicated that, in order to obtain significant changes in the impact upon highway safety through traffic adjudication procedures, special facilities and programs must be made available for identified habitually-deviant drivers to change their errant attitude and driving behavior patterns, and special adjudicators must be trained to conduct unbiased hearings and to utilize these special programs appropriately.

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DOT-HS-6-01285  
Rept. No. PRC-R-1857-Vol-1; 1978; 213p  
Rept. for 30 Sep 1975-Jul 1978. Vol. 2, Discussion,  
Interpretation, and Appendices, is HS-803 796; Vol. 3, Special  
Summary Report, is HS-803 797.  
Availability: NTIS

HS-803 796

**DECRIMINALIZATION: ADMINISTRATIVE  
ADJUDICATION. VOL. 2: DISCUSSION,  
INTERPRETATION, AND APPENDICES [TRAFFIC  
OFFENSES]. FINAL REPORT**

A discussion and interpretation of findings, and appended information, are provided for a study which examined the issues of "fairness," "efficiency," and "effectiveness," of processes in the administrative adjudication of decriminalized traffic offenses vs. processes in the traditional (court) adjudication of traffic offenses. Two sites presently using administrative adjudication techniques for most moving-traffic infractions, Buffalo, N.Y. and the State of North Dakota, were compared respectively to Syracuse, N.Y. and the State of South Dakota, which currently use traditional adjudication processes for these offenses. Results show that decriminalization of traffic offenses alone, without a corresponding change within the traffic adjudication system itself, will not appreciably improve the fairness, efficiency, or impact on highway safety of that system. Even when a basic change in the system has been brought about, such as the Administrative Adjudication Bureau system in N.Y. State, for there to be an appreciable improvement in fairness and a beneficial impact on highway safety, special facilities and programs must be made available for habitually-deviant drivers to change their attitude and behavior. Special adjudicators must be trained to conduct un-

biased hearings and to utilize these special programs appropriately.

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DOT-HS-6-01285  
Rept. No. PRC-R-1857-Vol-2; 1978; 108p 16refs  
Rept. for 30 Sep 1975-Jul 1978. Vol. 1, Analysis and Findings,  
is HS-803 795; Vol. 3, Special Summary Report, is HS-803  
797.  
Availability: NTIS

HS-803 797

**DECRIMINALIZATION: ADMINISTRATIVE  
ADJUDICATION. VOL. 3: SPECIAL SUMMARY  
REPORT [TRAFFIC OFFENSES]. FINAL REPORT**

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PRC Systems Sciences Co., 7600 Old Springhouse Rd.,  
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DOT-HS-6-01285  
Rept. No. PRC-R-1857-Vol-3; 1978; 70p 16refs  
Rept. for 30 Sep 1975-Jul 1978. For abstract, see HS-803 795  
(Vol. 1, Analysis and Findings); Vol. 2, Discussion,  
Interpretation, and Appendices, is HS-803 796.  
Availability: NTIS

HS-803 799

**EFFECTS OF HOURS OF SERVICE, REGULARITY  
OF SCHEDULES, AND CARGO LOADING ON  
TRUCK AND BUS DRIVER FATIGUE. FINAL  
REPORT**

A literature review, a nationwide (U.S.) survey of commercial truck and bus driver work patterns, an analysis of accident data, and three extensive field experiments were conducted to establish evidence concerning driver fatigue as a function of regularity or irregularity of work schedules, duration of on-duty cycles, participation in supplemental cargo loading work, and type of operation (relay vs. sleeper). In this, the second phase of the study, drivers on irregular schedules were evaluated. Data are presented concerning the relative amounts of fatigue experienced by truck and bus drivers under these various conditions, as reflected in their subjective ratings, in various measures of physiological status, and in the quality of their driving performance. The results are related to accident data in which fatigued, drowsy, or inattentive drivers were reportedly involved. Conclusions are drawn regarding current Dept. of Transportation regulations on hours of service. The results of Phase 2 support the conclusions drawn from Phase 1: that significant increases in driver performance errors and decreases in psychophysiological arousal occur within current Dept. of Transportation limitations on driving time; that sleeper drivers experience more severe fatigue than relay drivers; that cumulative fatigue effects appear after four consecutive days on duty; and that there are marked variations in arousal level which correlate strongly with accident occurrence

(accidents in which the driver was judged to be drowsy, inattentive, or sleeping).

by Robert R. Mackie; James C. Miller  
Human Factors Res., Inc., 5775 Dawson Ave., Goleta, Calif.  
93017  
DOT-HS-5-01142  
Rept. No. 1765-F; 1978; 281p 86refs  
Rept. for May 1975-Oct 1978.  
Availability: NTIS

HS-803 801

#### **UNIFORM TIRE QUALITY GRADING TREADWEAR COURSE MONITORING--4. FINAL REPORT**

Continued evaluation of certain previously selected course monitoring tires (CMT's) and monitoring of the 400-mi public-roads course at San Angelo, Texas, used in the Uniform Tire Quality Grading program, were accomplished during the period Jun 1976-Sep 1977. Four new 1976 Chevrolet Malibu Chevelles (GR78-15 original equipment) were used because the G78-15 (GR78-15 Radial) tire is specified as the CMT size and because the 1975 model Chevelle had been used during three previous phases of this test program. In this fourth phase of the program, 99 test series of 6400 mi each were conducted in 33 successive convoys of three cars each. Each of the three cars in the convoy ran radial, belted bias, or bias construction tires as assigned for each test set. Resultant tread wear rates for each tire and the related projected mileage estimates are tabulated. Details of the test procedures are presented.

by Richard N. Pierce  
Southwest Res. Inst., Tire Evaluation Section, P.O. Drawer  
28510, San Antonio, Tex. 78284  
DOT-HS-6-01348  
1978; 339p 7refs  
Rept. for Jun 1976-Sep 1977.  
Availability: NTIS

HS-803 806

#### **REVISION OF NHTSA [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] CURRICULUM PACKAGES. FINAL REPORT**

Sixteen National Hwy. Traffic Safety Administration in-print curriculum packages were analyzed, and three were selected for revision: the highway traffic records course, the traffic court judge workshop, and the emergency medical technician (EMT) course. Selection was based primarily on value to the states in carrying out annual programs. The revision process resulted in an essentially new traffic records course; the revised course focuses on the fundamental relationship between the traffic records system and the highway safety program, and emphasizes crash data and safety program management data subsystems. The revision effort for the traffic court judge workshop essentially represented a repackaging of the original program. The revision process for the EMT course consisted primarily of an extensive technical update with added emphasis on patient assessment and reinforcement of basic emergency care procedures. A standardized three-part curriculum package was prepared for each program, consisting of a course guide for the training administrator, lesson plans for the instructor, and a study guide for the student. A set of 2

x 2, 35 mm trauma slides was prepared to aid instructors of the EMT course.

by Arlene M. Clevon  
Dunlap and Associates, Inc., One Parkland Drive, Darien,  
Conn. 06820  
DOT-HS-5-01244  
Rept. No. ED-77-2; 1978; 59p 8refs  
Rept. for Jun 1975-Jun 1978.  
Availability: NTIS

HS-803 807

#### **DEVELOP AND TEST AN ASSOCIATE DEGREE PROGRAM FOR TRAFFIC RECORDS ANALYST. FINAL REPORT**

An effort was undertaken to identify a community college to pilot test a traffic records associate degree program using the National Hwy. Traffic Safety Administration's (NHTSA) three-part training package, Traffic Records Analysis. A review is presented of the role of the American Assoc. of Community and Junior Colleges (AACJC) in previous highway/traffic safety education activities for NHTSA, traffic records system personnel requirements, the approved plan for AACJC to select an accredited community college to develop and offer the traffic records analyst program, and recommendations concerning pilot testing NHTSA programs. From a list of approximately 100 colleges likely to have an interest in traffic records programs, Northern Virginia Community Coll., Alexandria, Va., and Harrisburg Area Community Coll., Harrisburg, Pa., were selected as meeting all of the criteria for a demonstration institution and as being conveniently located, near NHTSA and AACJC. Although community college and Dept. of Transportation personnel in Va. and Pa. revealed a desire to employ traffic records analysts who graduated from associate degree programs, it was impossible to obtain any assurances from potential employers. In addition to fiscal restraints of the highway departments, it is noted that community colleges have been forced to limit their expenditures and to avoid developing new programs unless there are very clear indications that enrollments will be sufficient to justify a new program. Because of this, no community college was able to assume the added cost of developing and offering new courses for the associate degree program.

by Richard E. Wilson  
American Assoc. of Community and Junior Colleges, One  
Dupont Circle, Washington, D.C. 20036  
DOT-HS-5-01239  
1977; 27p refs  
Rept. for 1 Jul 1975-31 Aug 1977.  
Availability: NTIS

HS-803 809

#### **DEVELOPMENT OF SPECIFICATIONS FOR PASSIVE BELT SYSTEMS. FINAL REPORT**

A study was undertaken to test the applicability to passive belt systems of the comfort and convenience of recommended active belt changes to Federal Motor Vehicle Safety Standard (FMVSS) 208; to modify and/or verify recommended changes; and to provide the National Hwy. Traffic Safety Administration with recommendations to provide front seat occupants with a passive belt system that is comfortable, convenient to use, and acceptable to the consumer while providing optimum protection in the event of a crash. The study approach in-



volved a state-of-the-art survey to determine the nature of potentially viable belt systems likely to meet the new passive belt edict, conduct of an evaluative experiment designed to arrive at a better understanding of the comfort and convenience implications of the various configurations, formulation of a preliminary set of passive belt system design/performance requirements based on the results of the experiment, and formulation of a final set of recommendations for modifying FMVSS 208. Results of the study show subjects rank passive belt systems in the following order of decreasing preference: nonmotorized two-point, motorized three-point, motorized two-point, and nonmotorized three-point. Convenience of the system was found to be the main consumer concern. The most critical problem areas that appear to require rulemaking attention include proper torso belt fit, belt pressure, head clearance (for motorized torso belt system), torso belt articulation rate (for motorized torso belt systems), ability to adjust the seat without belt restriction, and location of emergency-release buckle where most people expect to find it. Recommended is future research to clarify the safety implications of using passive belt or air bag systems with adjustable seat backs that can be folded all the way back, and to clarify the safety implications of using a two-point system for the right front passenger in a vehicle equipped with a front bench seat.

by W. E. Woodson; T. L. Black; P. H. Selby; R. Coburn  
Man Factors, Inc., 4433 Convoy St., San Diego, Calif. 92111  
DOT-HS-7-01617  
Rept. No. MFI-78-109-(R); 1978; 230p 61refs  
Rept. for Jul 1977-Dec 1978.  
Availability: NTIS

## HS-803 810

### FATAL ACCIDENT REPORTING SYSTEM (FARS). 1977 ANNUAL REPORT [NO. 3]

This first of two volumes of the third annual Fatal Accident Reporting System report provides statistical data on the vehicles and persons involved in fatal accidents in the U.S. in 1977 (with some comparison data for 1975 and 1976). The second volume contains supporting data. A total of 47,715 people were killed in the U.S. in 42,064 fatal accidents during 1977. Over 40% of the vehicles involved in fatal accidents were in single-vehicle accidents. Although 58% of the fatal accidents occurred in rural areas, only 46% of the total vehicle miles were in these areas. Fatalities per 100 million vehicle miles increased between 1976 and 1977 by 1.2%, the first increase since 1966. Young drivers (under 25) were more likely to have been drinking, had more previous traffic offense convictions, and were more likely to be involved in fatal accidents at night and on weekends. In passenger car/truck accidents there were 2673 car occupant fatalities and 122 truck occupant fatalities; for passenger car/motorcycle accidents there were 21 car occupant and 1405 motorcycle occupant fatalities. The number of vehicles in fatal accidents increased by 7% over 1976; in contrast, the number of motorcycles in these accidents increased by 24%. There were 157 fatalities in school bus accidents: 19 school bus passengers, 1 school bus driver, 83 occupants of other vehicles, 54 pedestrians or pedalcyclists (70% of the last group under 16 years of age). Only 20% of the 7705 pedestrian and 916 pedalcyclist fatalities occurred at intersections.

National Hwy. Traffic Safety Administration, National Center for Statistics and Analysis, Washington, D.C. 20590  
1978; 51p  
Availability: Corporate author

## HS-803 812

### EQUILIBRIUM AND TRANSIENT ROLLING RESISTANCE OF TRUCK TIRES MEASURED ON CALSPAN'S TIRE RESEARCH FACILITY. FINAL REPORT

A test program designed to characterize the rolling resistance characteristics of those tires to be used for the ongoing Dept. of Transportation/Society of Automotive Engineers Truck and Bus Fuel Economy Verification Prog. was conducted at the Calspan Tire Res. Facility. The tire sample included both radial ply and bias ply tires in four of the most popularly used sizes (9.00-20/F, 10.00-20/G, 9.00R20/F, and 11522.5/G). Rolling resistance coefficients for the bias ply tires were about 50% larger, on the average, than those for the radial ply tires. The radial tires equilibrated thermally in a much shorter distance. Within a given tire size, the range of rolling resistance coefficients among tires was significantly larger for the bias tires. In general, at tire equilibrium temperatures, the coefficients increased slightly with increasing load. At tire constant temperatures, the normal load sensitivity was 2 to 3 times as large. Radial tires showed less sensitivity of rolling resistance coefficient to normal load. At constant temperatures, coefficients increased with velocity at substantially similar rates for both bias types, the magnitude of velocity effect decreasing as tire temperature increased. At equilibrium temperatures, rolling resistance coefficients decreased slightly with velocity at similar rates for both tire types, the absolute magnitude of the velocity effect being about 1/3 of that for constant temperatures. The equilibrium coefficient was a strong function of inflation pressure and decreased with increasing pressure. At constant temperatures, the effect of normal load on the coefficient was relatively independent of inflation pressure. Coefficients increased drastically with transient changes in slip angle, approximately doubling in value at plus/minus 2 degrees relative to 0 degrees. At equilibrium temperatures, the radial ply tires, on the average, showed coefficients about 6% larger for a flat roadway vs. a 67.23-in diameter drum (compared to 8% lower for bias ply tires). Coefficients for all tires, as measured under conditions of tire constant and equilibrium temperatures, decreased with increasing positive wheel torque (coefficient generally larger at constant temperature).

by I. Gusakov; G. A. Tapia; L. Bogdan  
Calspan Corp., 4455 Genesee St., Buffalo, N.Y. 14221  
DOT-OS-60156  
Rept. No. ZM-5947-T-2; 1979; 137p 8refs  
Rept. for Nov 1977-May 1978. Also conducted under Agreement for Services No. 40097 with Rockwell International.  
Availability: NTIS

## HS-803 816

### PEDESTRIAN IMPACT: BASELINE AND PRELIMINARY CONCEPTS EVALUATION. VOL. 1: SUMMARY [PEDESTRIAN/VEHICLE ACCIDENT DYNAMICS]. FINAL REPORT

by H. B. Pritz; C. R. Hassler; E. B. Weis  
Batelle, Columbus Labs., 505 King Ave., Columbus, Ohio 43201  
DOT-HS-4-00961  
1978; 29p  
Rept. for Jul 1974-May 1978. For abstract, see Vol. 2, Technical Discussion, HS-803 817.  
Availability: NTIS



HS-803 817

**PEDESTRIAN IMPACT: BASELINE AND PRELIMINARY CONCEPTS EVALUATION. VOL. 2: TECHNICAL DISCUSSION [PEDESTRIAN/VEHICLE ACCIDENT DYNAMICS]. FINAL REPORT**

An experimental study was conducted to investigate the significance of vehicle front design parameters on pedestrian impact dynamics, specifically to quantify the present pedestrian hazard and to assess the injury reduction potential of a number of selected vehicle configurations. Highly-instrumented experimental impacts were conducted using adult and 6-year-old-child anthropomorphic dummies and unembalmed cadaveric specimens. In all, 80 dummy impacts (36 child and 44 adult) and 11 unembalmed cadaveric impacts were conducted over the speed range from 10 mph to 30 mph with present production vehicles, candidate injury-mitigating concepts, and the first-generation Research Safety Vehicles. Results indicate that significant reductions in injury severity can be realized through vehicle front design changes and increased surface compliance.

by H. B. Pritz; C. R. Hassler; E. B. Weis  
Batelle, Columbus Labs., 505 King Ave., Columbus, Ohio 43201  
DOT-HS-4-00961  
1978; 151p 6refs  
Rept. for Jul 1974-May 1978. Vol. 1, Summary, is HS-803 816.  
Availability: NTIS

HS-803 831

**PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 2: 1978 PONTIAC, 301 CID (4.9 LITERS), 2V. INTERIM REPORT, MAY 1978**

Experimental data are presented which were obtained in dynamometer tests of a 1978 Pontiac 301 cu-in-displacement (CID) engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle equipped with automatic transmission. Pontiac uses the engine in vehicles in the 3500 lb to 4500 lb weight class. This engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications, engine break-in schedule, and fuel analysis are provided.

by D. E. Koehler; W. F. Marshall  
Department of Energy, Bartlesville Energy Technology Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/21; DOT-TSC-NHTSA-79-2; 1979; 59p  
Availability: NTIS

HS-803 832

**PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES.**

**THIRD SERIES, REPORT NO. 3: 1978 AMC, 121 CID (2.0 LITERS), 2V. INTERIM REPORT, MAY 1978**

Experimental data are presented which are obtained in dynamometer tests of a 1978 AMC 121 cu-in-displacement engine (CID) to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle equipped with manual transmission. American Motors Corp. uses the engine in vehicles in the 2750 lb to 3000 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications, engine break-in schedule, and fuel analysis are provided.

by Don E. Koehler  
Department of Energy, Bartlesville Energy Technology Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/20; DOT-TSC-NHTSA-79-3; 1979; 59p  
Availability: NTIS

HS-803 833

**PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 4: 1978 PONTIAC, 151 CID (2.5 LITERS), 2V. INTERIM REPORT**

Experimental data are presented which were obtained in dynamometer tests of a 1978 Pontiac 151 cu-in-displacement (CID) engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle equipped with automatic transmission. Pontiac uses the engine in vehicles in the 3000 lb to 3500 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications, engine break-in schedule, and fuel analysis are provided.

by D. E. Koehler; W. F. Marshall  
Department of Energy, Bartlesville Energy Technology Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/22; DOT-TSC-NHTSA-79-4; 1979; 62p  
Availability: NTIS

HS-803 834

**PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 5: 1978 CHEVROLET, 200 CID (3.3 LITERS), 2V. INTERIM REPORT, JUNE 1978**

Experimental data are presented which were obtained in dynamometer tests of a 1978 Chevrolet 200 cu-in-displacement (CID) engine to determine fuel consumption and emissions

(hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle equipped with automatic transmission. Chevrolet uses the engine in vehicles in the 3500 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications, engine break-in schedule, and fuel analysis are provided.

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RA-77-07  
Rept. No. BETC/OP-78/30; DOT-TSC-NHTSA-79-5; 1979; 61p  
Availability: NTIS

HS-803 835

**PERFORMANCE CHARACTERISTICS OF  
AUTOMOTIVE ENGINES IN THE UNITED STATES.  
THIRD SERIES, REPORT NO. 6: 1978 VOLKSWAGEN  
DIESEL, 90 CID (1.5 LITER), F. I. [FUEL  
INJECTION]. INTERIM REPORT, JULY 1978**

Experimental data are presented which were obtained in dynamometer tests of a 1978 VW 90 cu-in-displacement diesel engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle equipped with manual transmission. Volkswagen uses this diesel engine in the VW Rabbit, which is in the 2250 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications and fuel analysis are provided.

by D. E. Koehler; W. F. Marshall  
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Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/33; DOT-TSC-NHTSA-79-6; 1979; 42p  
Availability: NTIS

HS-803 836

**PERFORMANCE CHARACTERISTICS OF  
AUTOMOTIVE ENGINES IN THE UNITED STATES.  
THIRD SERIES, REPORT NO. 7: 1978 FORD, 98 CID  
(1.6 LITERS), IN. INTERIM REPORT, JULY 1978**

Experimental data are presented which were obtained in dynamometer tests of a 1978 Ford 98 cu-in-displacement (CID) engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle with automatic transmission. Ford uses the engine in the Fiesta which is in the 2000 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for esti-

imating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications and fuel analysis are provided.

by D. E. Koehler; W. F. Marshall  
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Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/34; DOT-TSC-NHTSA-79-7; 1979; 63p  
Availability: NTIS

HS-803 837

**PERFORMANCE CHARACTERISTICS OF  
AUTOMOTIVE ENGINES IN THE UNITED STATES.  
THIRD SERIES, REPORT NO. 8: 1978 BUICK, 231  
CID (3.8 LITER), 4V, TURBOCHARGED. INTERIM  
REPORT, SEPTEMBER 1978**

Experimental data are presented which were obtained in dynamometer tests of a 1978 Buick 231 cu-in-displacement (CID), turbocharged engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle equipped with automatic transmission. Buick uses the engine in the Regal Sport Coupe and the LeSabre Sport Coupe which are in the 3500 lb to 4000 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications, engine break-in schedule, and fuel analysis are provided.

by D. E. Koehler; W. F. Marshall  
Department of Energy, Bartlesville Energy Technology  
Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/43; DOT-TSC-NHTSA-79-8; 1979; 60p  
Availability: NTIS

HS-803 838

**PERFORMANCE CHARACTERISTICS OF  
AUTOMOTIVE ENGINES IN THE UNITED STATES.  
THIRD SERIES, REPORT NO. 9: 1978 FORD, 300 CID  
(4.9 LITER), IV. INTERIM REPORT, SEPTEMBER  
1978**

Experimental data are presented which were obtained in dynamometer tests of a 1978 Ford 300 cu-in-displacement (CID) truck engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) pickup or van with automatic transmission. Ford uses the engine in pickups and vans in the 4000 lb to 4500 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving

ground transportation. Manufacturer's engine specifications, engine break-in schedule, and fuel analysis are provided.

by D. E. Koehler; W. F. Marshall  
Department of Energy, Bartlesville Energy Technology  
Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/43; DOT-TSC-NHTSA-79-9; 1979; 59p  
Availability: NTIS

HS-803 839

**PERFORMANCE CHARACTERISTICS OF  
AUTOMOTIVE ENGINES IN THE UNITED STATES.  
THIRD SERIES, REPORT NO. 10: 1978 HONDA, 98  
CID (1.6 LITERS). INTERIM REPORT, DECEMBER  
1978**

Experimental data are presented which were obtained in dynamometer tests of a 1978 Honda 98 cu-in-displacement (CID) engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, nitrogen oxides) at steady-state engine operating modes. This engine is intended for use in a 49-states (Federal) vehicle equipped with automatic transmission. Honda uses the engine in the Accord which is in the 2250 lb weight class. The engine is one of a series of 15 engines to be tested in a program to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The purpose is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation. Manufacturer's engine specifications, engine break-in schedule, and fuel analysis are provided.

by D. E. Koehler; W. F. Marshall  
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Center, P.O. Box 1398, Bartlesville, Okla. 74003  
RA-77-07  
Rept. No. BETC/OP-78/55; DOT-TSC-NHTSA-79-10; 1979;  
42p  
Availability: NTIS

HS-803 840

**EVALUATION OF AUTOMOBILE DRIVETRAIN  
COMPONENTS TO IMPROVE FUEL ECONOMY.  
FINAL REPORT**

Wide ratio range automatic transmissions with lockup torque converters could be in production by the early 1980's. In order to evaluate their impact upon fuel economy, emissions, driveability, acceleration, and durability, four 1975 Chrysler automobiles with inertia weights and engine sizes typical of that time period were equipped with Multi-Purpose Test Transmissions. These transmissions could duplicate current three-speed automatic transmissions; wide-range, three-speed automatic transmissions; and wide-range, four-speed automatic transmissions with or without torque converter lockup. The following transmission modes were tested: baseline or production three-speed automatic; baseline automatic with lockup in second and third gears; wide-ratio, three-speed automatic; wide-ratio, three-speed automatic with lockup in third; wide-ratio, three-speed automatic with lockup in second and third, with and without lockup below 30 mph; wide-ratio, four-speed automatic; wide-ratio, four-speed automatic with lockup in fourth; and wide-ratio, four-speed automatic with lockup in third and fourth. Predicted fuel economy values agreed with actual fuel econo-

mies within the resolution of the test method. Composite fuel economy improvements up to 14% were achieved with no change in acceleration and durability. Further development work is required to bring emissions and driveability to acceptable levels. Maximum increases in fuel economy due to drivetrain improvements have not been demonstrated due to the possibility for further optimization of engine road load matching and the impacts of emission and driveability modifications.

by Donald Hurter; Philip Gott  
Arthur D. Little, Inc., Acorn Park, Cambridge, Mass. 02140  
DOT-TSC-1046  
Rept. No. DOT-TSC-NHTSA-79-12; 1979; 115p 11refs  
Rept. for Jun 1975-Nov 1977.  
Availability: NTIS

HS-803 858

**EMS [EMERGENCY MEDICAL SERVICES]  
COMPATIBILITY STUDY. FINAL REPORT**

A project was undertaken to provide design standards and recommendations for the implementation of compatible, effective communications systems for emergency medical services (EMS) utilizing the UHF frequencies allocated by the Federal Communications Commission. Five major task areas involved visiting seven major operational EMS communications systems, formulating design standards, investigating disaster situations, studying the interaction of EMS with other public safety services, and studying the possible use of innovative communications concepts in EMS systems. Major recommendations on design standards include the following: adopt standard nomenclature, channelization, and designation of the ten UHF frequency pairs; provide full ten-frequency capability in base, mobile, and high-power portable radios, and eight-frequency capability in low-power portable radios; adopt four UHF frequencies for mobile relay control purposes; adopt standards to allow interarea access between systems (continuous monitoring of 467.975 MHz, designated as the MED-COMMON channel to be used for interarea access; implementation of a common tone frequency for interarea access, 210.7 Hz, in UHF EMS radio equipments); and adopt standards to prevent or defeat potential system 'lockup' that can be caused by two-way vehicular repeaters operating into an area utilizing mobile relays (select local tone frequencies from distinct groupings, provide positive control of mobile relays at control point). Additional recommendations addressing system vulnerability in disaster situations include the following: provide base stations and control equipment with emergency back-up to commercial power; where landlines are used for base station control, provide an alternate control method, such as radio or local control, for a portion of the total base station complement; and provide back-up to hospital switching matrix.

by Sandra Archambault; Frank Pethel  
Systech Corp., Codd Professional Bldg., Severna Park, Md.  
21146  
DOT-HS-7-01818  
1978; 116p  
Rept. for Oct 1977-Sep 1978.  
Availability: NTIS

HS-803 867

**COMMENTS OF HOUDAILLE INDUSTRIES ON THE BUMPER STANDARD. SUBMISSIONS TO THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION BETWEEN DECEMBER 27, 1978, AND FEBRUARY 15, 1979**

A compilation is presented of correspondence and comments, the major portion being a cost-benefit study of bumper regulations. These were submitted to the National Hwy. Traffic Safety Administration (NHTSA) by Houdaille Industries, Inc. which undertook to determine what bumper standard is most cost-beneficial to the American Consumer. Phase 1 of NHTSA's two-phase Part 581 bumper standard, which became effective in Sep 1978, requires that the car body, other than the bumper, not be damaged in barrier and pendulum tests at 5 mph. Phase 2, to become effective in Sep 1979, requires that there be only limited damage to the bumper itself in such tests, as well as no damage to the rest of the car. The study was developed by Dr. David Wise of Harvard Univ. and implemented by a computer program designed by Dr. Niel Roth. NHTSA endorsed the work of both participants. Also commissioned by Houdaille were crash tests conducted at Calspan Advanced Technology Center to compare two 1978 Volare/Aspen production bumper designs, one built in compliance with Part 581, Phase 1, the other a Mexican version of the bumper (equivalent to a 2.5-mph barrier-only standard). The cost-benefit study of the Volare/Aspen, the first comparison undertaken to isolate the real-world impact of Federal bumper regulations, revealed that the current 5-mph Federal bumper regulation costs American consumers \$70 per car more than the benefits it provides, including the cost, due to extra weight, of 55 extra gallons of gasoline over the lifetime of each car. The more stringent Phase 2 regulation will add further to the cost. The Mexican version of the bumper was found to be cost-beneficial.

Houdaille Industries, Inc., One Financial Plaza, Fort Lauderdale, Fla. 33394

1979; 284p refs

Availability: National Hwy. Traffic Safety Administration, 400 7th St., S.W., Washington, D.C. 20590

HS-803 868

**CALCULATIONS AND SUPPORTING MATERIAL FOR THE PRELIMINARY ANALYSIS OF THE BUMPER STANDARD**

Information is presented in support of the National Hwy. Traffic Safety Administration's (NHTSA) preliminary analysis of the Part 581 bumper standard, submitted to Congress on 26 Jan 1979. The analysis indicated that the performance requirements of the bumper standard provide substantial net benefits to consumers over the lifetime of a vehicle, but that the 5-mph standard does not necessarily result in the greatest net benefits. Accompanying this information is an Advance Notice of Proposed Rulemaking indicating that NHTSA is considering whether modification to the standard is appropriate and is seeking additional data from interested parties (Docket No. 73-19; Notice 25). Phase 1 of the Part 581 bumper standard, effective on 1 Sep 1978, requires no damage to the vehicle in a 5-mph barrier equivalent crash but permits unlimited damage to the bumper itself. Phase 2 of the standard which takes effect 1 Sep 1979, permits only limited damage to the bumper itself. This cost-benefit analysis has shown that both 2.5-mph

and 5.0-mph bumpers yield substantial net benefits. The net benefits of aluminum and soft-face bumper systems are nearly equal at both 2.5 mph and 5.0 mph, and the net benefits of steel systems appear significantly greater at 2.5 mph than at 5.0 mph. At both 2.5 mph and 5.0 mph, the net benefits of steel bumper systems are less than those of aluminum and soft-face bumper systems. Material choices of this type point out the role of manufacturers in determining the amount of benefits that consumers actually achieve. Automobile fuel economy is a major factor in these design decisions.

National Hwy. Traffic Safety Administration, 400 7th St., S.W., Room 4423, Washington, D.C. 20590

1979; 75p 19refs

Availability: Corporate author

HS-803 871

**COST EVALUATION FOR FOUR FEDERAL MOTOR VEHICLE STANDARDS. VOL. 1. FINAL REPORT**

Total consumer out-of-pocket costs have been estimated for four Federal Motor Vehicle Safety Standards (FMVSS): FMVSS 214, Side Door Strength; FMVSS 215, Exterior Protection; FMVSS 301, Fuel System Integrity; and FMVSS 208, Occupant System Integrity. For each standard a representative sample of makes and models of vehicles was established. The parts required to meet the safety standard were purchased and their costs estimated. The first year of standard implementation and the year immediately preceding it were emphasized. By analysis, the consumer costs attributable to the standard for each make and model were determined. A weighted average was developed from the sample vehicles and applied to the total industry volumes to determine the out-of-pocket cost for the implementation of each standard. The weighted average of weight variance per vehicle due to standard implementation also was determined for FMVSS's 214, 215, and 301. For FMVSS 214, the implementation out-of-pocket cost was found to be \$30.08 with a weight increase of 36.1 lb/vehicle; for FMVSS 215, a cost of \$26.54 and a weight increase of 54.3 lb/vehicle for the 1973 version of the standard, and an accumulative cost of \$48.47 and a weight increase of 76.7 lb/vehicle for the 1973 and 1974 versions; for FMVSS 301, a cost of \$.05 and a weight increase of .6 lb/vehicle for the 1968 version, and a cost of \$6.89 and a weight increase of 1.8 lb/vehicle for the 1976 version; and for FMVSS 208, a cost of \$14.05 for the 1968 version, and a cost of \$46.46 for the 1968 (lap belt) and 1972 (shoulder belt) standards. Addition of 1972 shoulder belt system to original lap belt system for front seats only cost \$11.00 per vehicle.

by Robert F. McLean; Clifford Eckel; David Cowan  
John Z. De Lorean Corp., Res. and Engineering Div., P.O.  
Box 427, Bloomfield Hills, Mich. 48013

DOT-HS-7-01767

1978; 127p

Rept. for Oct 1977-Oct 1978. See also HS-803 873.

Availability: NTIS

HS-803 873

**COST EVALUATION FOR FOUR FEDERAL MOTOR VEHICLE STANDARDS. TASK 6, ADDITIONAL**

October 31, 1979

HS-803 892

## **BUMPERS, FMVSS 215, EXTERIOR PROTECTION. FINAL REPORT**

A detailed automotive type cost analysis and weight study was made of the following bumper systems to determine if consumer cost variance was directly attributable to changes in FMVSS (Federal Motor Vehicle Safety Standard) 215, Exterior Protection, or to the latest design and manufacturing technology employed over subsequent model years since FMVSS 215 implementation: 1979 Chrysler Volare, 1979 Chrysler LaBaron, 1979 Ford Pinto, 1979 Ford Fairmont, 1979 Ford LTD II, 1979 Ford LTD, 1979 Firebird, 1979 GM (General Motors) Camaro, 1979 GM Nova, 1979 GM Grand AM, 1979 GM Malibu, 1979 GM Caprice, 1971 Volvo, 1973 Volvo, 1979 Volvo, and Tayco Design (front bumper only). For each bumper system, subassemblies and subassembly components are identified, with data on weight, general material types, processing methods, high-volume industrial fixed and variable cost, manufacturing cost, tooling cost, number of years for tooling amortization, other corporation costs and profit, dealer markup, and manufacturing cost per pound. The 1979 model production year economics and 1978 model production volume were utilized. Consumer replacement cost information on the bumpers is included. Components of the bumper system are identified by manufacturer's part numbers, part names, quantity, and over-the-counter customer prices (those valid in Nov 1978). An overview photograph study of all systems except the Tayco system is provided. In general, it was found that the weight per studied vehicle was decreased over the baseline (1973 model year for front bumper system, and 1974 model year for rear bumper system). The maximum weight reduction was 85.26 lb and the maximum weight increase was 12.67 lb. The cost varied from \$67.40 reduction to a \$37.55 increase. It is believed that the variation in consumer out-of-pocket cost and weight of the sample vehicles was not attributable to FMVSS 215, but to design and manufacturing technology.

by M. R. Harvey; Clifford Eckel; David Cowan  
John Z. De Lorean Corp., Res. and Engineering Div., P.O.  
Box 427, Bloomfield Hills, Mich. 48013  
DOT-HS-7-01767-Mod-3  
1978; 126p  
Rept. for 31 Aug-31 Dec 1978. See also HS-803 871.  
Availability: National Hwy. Traffic Safety Administration, 400  
7th St., S.W., Room 4423, Washington, D.C. 20590

HS-803 879

## **DRUGS AND DRIVING: A SELECTED BIBLIOGRAPHY. SUPPLEMENT ONE. FINAL REPORT**

This first supplement to a bibliography of literature dealing with the relationship between drug use (other than alcohol alone) and highway safety updates both the parent volume and expands coverage in certain research areas related to the field of drugs and highway safety (in particular, literature pertaining to drug usage patterns and drug analytical methodology). A detailed description of the literature scope and document selection process is provided. The bibliography consists of a topical index, an author index, a title index, and abstracts of nearly 400 articles. A revised topical index was developed to

improve user access to document abstracts. Within the topical index are cross-reference lists of drugs by name and by usage.

by Kent B. Joscelyn; Alan C. Donelson  
University of Michigan, Hwy. Safety Res. Inst., Huron Pkwy.  
and Baxter Rd., Ann Arbor, Mich. 48109  
DOT-HS-7-01530  
Rept. No. UM-HSRI-78-3; 1978; 276p 371refs  
Rept. for Jul 1975-Nov 1976. See also HS-802 187, HS-802 188,  
and HS-802 189.  
Availability: NTIS

HS-803 892

## **A CATEGORICAL ANALYSIS OF THE RELATIONSHIP BETWEEN VEHICLE WEIGHT AND DRIVER INJURY IN AUTOMOBILE ACCIDENTS. FINAL REPORT**

An analysis is presented of the effect of vehicle weight on driver injury using North Carolina accident data for 1973, 1974, and 1975. The descriptive analysis is based on a series of cross-tabulations of driver injury by vehicle weight across various subsets of the data (single-vehicle crashes, rural crashes, urban two-car crashes, high-speed crashes, etc.). As expected, single-vehicle accidents are found to be more serious than two-vehicle accidents, and rural accidents more serious than urban ones. Increased car weight is shown clearly to lessen the risk of serious or fatal injury for all accident types combined and for two-vehicle crashes. For single-vehicle crashes, a consistent relationship between car weight and driver injury is not found. In order to examine more closely the vehicle weight-driver injury relationship, linear categorical models are constructed for predicting serious (killed or seriously injured) driver injury as a function of vehicle weight and other related variables. The models are for single-vehicle crashes, belted drivers in two-car crashes, and for unbelted drivers in two-car crashes (three models corresponding to three speed categories). The incorporated variables are a basic (assumed) set of control variables based on previous research plus additional variables as suggested by 1973-1975 data. For the single-vehicle model, the variables are vehicle weight, region of impact, accident speed, belt use, and driver age. For the two-car models, the weight and region of impact for the second car are added to this set, and driver age omitted. The results of the modeling, for the most part, follow expectations. For the single-vehicle crash model, belted drivers have lower predicted serious injury rates than unbelted drivers, and younger drivers lower rates than older drivers. Drivers in the lightest weight category cars consistently have the highest predicted injury rates, but the other three weight categories are not always differentiated. For the two-car crash models, the vehicle weight categories are differentiated as expected for all but the low-speed crashes. An added dimension to this analysis is a series of tables showing predicted driver injury rates as a combined function of the weights and regions of impact for both cars.

by J. Richard Stewart; Jane C. Stutts  
University of North Carolina, Hwy. Safety Res. Center,  
Chapel Hill, N.C. 27514  
DOT-HS-4-00897  
1978; 93p 15refs  
Rept. for 30 Jun 1977-31 May 1978.  
Availability: Corporate author

HS-803 893

HS-803 893

**FACT BOOK. STATISTICAL INFORMATION ON HIGHWAY SAFETY. ANNUAL ISSUE NO. 2**

This compendium of highway traffic safety information presents statistical data on principal factors related to motor vehicles and motor vehicle accidents in the U.S. Data are presented variably for the years 1950 through 1976, and divided into the following categories and subcategories: highway safety highlights (exposure, accidents, injuries and fatalities, National Hwy. Traffic Safety Administration (NHTSA) safety programs, highlights of selected research); exposure (general highway statistics, driver population characteristics, vehicle population characteristics, travel speed statistics, modes of transportation and trip characteristics); accidents (general accident statistics, accident speed statistics, accident mode statistics); and injuries and fatalities (general statistics, fatalities and fatality rates, vehicle, speed, and mode statistics of fatalities). A glossary of terminology in the highway safety field is included. Sources of statistics are cited, including those from NHTSA and from other publications.

National Hwy. Traffic Safety Administration, National Center for Statistics and Analysis, 2100 2nd St., S.W., Washington, D.C. 20590

1977; 166p refs  
Availability: GPO

HS-803 897

**COST EVALUATION FOR FMVSS [FEDERAL MOTOR VEHICLE SAFETY STANDARD] 215, EXTERIOR PROTECTION**

An analysis was made of the incremental costs to already existing vehicle bumpers as a result of the implementation of the original Federal Motor Vehicle Safety Standard (FMVSS) 215, Exterior Protection, and its various revisions. Out-of-pocket cost and weight changes for pre-standard 1972 vehicle makes/models were compared with post-standard vehicle makes/models, based on 1973 model production year economics and volumes. FMVSS 215 became effective on 1 Sep 1972 (1973 model year) and was subsequently revised to affect the 1974, 1975, 1976 and 1977 model years. The analysis shows that implementation of the 1973 FMVSS 215 resulted in a consumer out-of-pocket cost of \$26.54 and a weight increase of 54.3 lb per vehicle over the 1972 pre-standard models. Implementation of the 1974 FMVSS 215, in addition to the 1973 standard, resulted in an accumulative consumer out-of-pocket cost of \$48.47 and a weight increase of 76.7 lb per vehicle over the 1972 pre-standard models. The 1975, 1976, and 1977 model year FMVSS revision requirements were combined with styling changes to such a degree that a clear assignment of cost and weight to either was not feasible. A trend study of the 1977 Chevrolet Caprice and the 1978 Chevrolet Malibu indicated that there was a weight and cost reduction in the bumper system from the baseline 1973 vehicle. It is believed that these reductions are a result of downsizing and styling changes. It is believed that the major cost to the consumer of the implementation of FMVSS 215 occurred in 1973 and 1974.

DOT-HS-7-01767

Publ: HS-803 871, "Cost Evaluation for Four Federal Motor Vehicle Standards. Vol. 1. Final Report," 1978 p38-62

1978; 27p

Availability: National Hwy. Traffic Safety Administration, Washington, D.C. 20590

HSL 79-10

HS-803 963

**IMPORT PASSENGER AUTOMOBILE WEIGHT PROJECTIONS, 1979-1986. MERCEDES-BENZ, BMW, VOLVO, BL LTD. FINAL REPORT**

A preliminary analysis is presented of the weight reduction capabilities of four European automakers (Mercedes-Benz, BMW, Volvo, and BL Ltd., formerly British Leyland) who may have difficulties meeting the U.S. fuel economy standards through the mid-1980's due to their limited product offering, i.e. luxury and/or sports vehicles with low fuel economy ratings. An overview of these manufacturers' product plans, financial status, and production status was developed from publicly available sources; actions to improve corporate and vehicle fuel economy ratings are highlighted. Even with expanded use of diesel engines (development of which is subject to stricter emission standards) and turbochargers, substantial weight loss probably would be needed to meet legislated goals. An analysis of potential weight reduction through the mid-1980's was performed based on engineering analysis and the manufacturer's known product plans to the extent available. Individual manufacturer's strategies of weight loss due to all new vehicle design, major sheet metal change, and component redesign and material substitution were formulated, drawn in part from weight reduction successes achieved by U.S. manufacturers. Results are presented at the detail level by manufacturer and model and at the summary level by series and Environmental Protection Agency market class. Weight loss potentials from 11% to 32% (depending on vehicle size and engine type) were estimated for the period 1978-1986.

by Theodore Taylor, Jr.; Madelyn C. Isaacs; Katherine E. Blythe

Corporate-Tech Planning Inc., 275 Wyman St., Waltham, Mass. 02154

DOT-HS-7-01789

1978; 145p refs

Rept. for Aug-Oct 1978.

Availability: Corporate author

HS-810 339

**REMARKS AT MAINTENANCE COMMITTEE MEETING [REGULAR COMMON CARRIER CONFERENCE], NEW ORLEANS, JANUARY 17, 1979 [TRUCK SAFETY]**

Current NHTSA (National Hwy. Traffic Safety Administration) truck safety activities are outlined for representatives of the trucking industry. Recent changes have been made to NHTSA's draft five-year rulemaking plan for heavy trucks which was issued in 1978 and to which response has been received from manufacturers, the American Trucking Associations, Inc., and labor groups. The changes consist of moving several proposed near-term rulemaking efforts into the longer-term exploratory category (i.e. tire inflation warning systems, hydraulic truck brake performance, controls and displays, and conspicuity), and adding a proposed standard on interior noise levels to the near-term standards list. These actions are in line with trucking industry suggestions that NHTSA take more time, and work with the industry, to develop substantial cost/benefit data on prospective standards. A new office at NHTSA to work with industry on an expanded program of truck safety research will undertake projects including an evaluation of test procedures and performance levels for both hydraulic and air brake trucks without antilock systems, a comprehensive field evaluation of engine and driveline retar-

October 31, 1979

HS-810 342

rs, longer-term studies of advanced braking systems, and evaluations of ride quality, handling and stability, and tire traction. NHTSA also is considering the early issuance of commended Practices on brake knob layout, trailer wiring, vehicle weight distribution, exhaust outlet location, road speed limiters, heated rearview mirrors, and splash and spray reduction.

Howard Dugoff  
National Hwy. Traffic Safety Administration, Washington,  
D.C. 20590  
1979; 7p  
Availability: Corporate author

S-810 340

**REMARKS BEFORE THE CHRYSLER RETREAT,  
ANN ARBOR, MICHIGAN, JANUARY 18, 1979 [FUEL  
ECONOMY REGULATORY PROGRAM]**

The background, purposes, anticipated benefits, and problems and limitations of Federal fuel economy regulations are addressed in brief. The Energy Policy and Conservation Act of 1975 created the Automotive Fuel Economy Regulatory Program, providing for the establishment of average fuel economy standards applicable to passenger cars beginning with the 1978 model year. By statute, the 1985 fuel economy standard is set at 27.5 mpg, a virtual doubling of the 1974 model year average. The standards will result in the conservation of 220 billion gallons of gasoline over the life of vehicles covered by these regulations, projected through model year 1990. Total national petroleum consumption will be reduced by about 13% by the 1990's as a result of these standards. Conservatively valuing gasoline at \$.65/gal, the total value of the fuel saved in 78 dollars (discounted at 10%) is \$60 billion. The combined potential savings of other measures, including carpooling, the 55 mph speed limit, the voluntary program for trucks and buses, and highway efficiency improvements, are expected to amount to only about 1/7 of the total savings yielded by the fuel economy program. Another benefit is the significant reduction in net ownership costs to consumers over the operating life of new vehicles (lifetime fuel savings of \$900 for typical 1985 model year car vs. \$300 increase in cost of vehicle as a result of regulation). A unique measurement instrument of the program, the Corporate Average Fuel Economy Label, permits diversity in the market and assures steady improvement in fuel conservation. It is indicated that the 27.5 mpg level will be both technologically feasible and economically practicable for the auto industry, although the program's impact on each manufacturer will be distinctly different. The current economy program is oriented toward the short term; government and industry need to cooperate in a program of advanced research to develop truly revolutionary advancements in automotive fuel economy.

Howard Dugoff  
National Hwy. Traffic Safety Administration, Washington,  
D.C. 20590  
1979; 5p  
Availability: Corporate author

S-810 341

**STATEMENT BEFORE THE SUBCOMMITTEE ON  
CONSUMER PROTECTION AND FINANCE, HOUSE  
INTERSTATE AND FOREIGN COMMERCE  
COMMITTEE, CONCERNING AUTHORIZATIONS**

**FOR AND IMPLEMENTATION OF THE NATIONAL  
TRAFFIC AND MOTOR VEHICLE SAFETY ACT,  
AND THE MOTOR VEHICLE INFORMATION AND  
COST SAVINGS ACT, FEBRUARY 26, 1979**

Authorizations for the National Hwy. Traffic Safety Administration (NHTSA), the agency's recent performance, and plans for fiscal year 1980 are addressed. Of the \$60 million in authorizations NHTSA is seeking for 1980, one of the major items is the National Center for Statistics and Analysis (60% funded under Vehicle Safety Act) which is designed to provide the agency as well as industry and the public with a statistically sound projection of the extent and nature of highway accidents. Much of the data are used to evaluate and to substantiate the benefits and costs of safety standards. The pilot phase of the Center's National Accident Sampling System is complete, and the data collection teams will expand from 10 to 20 in FY 1980. In FY 1980, \$4 1/2 million will be spent on the research safety vehicle program. NHTSA will continue developing new safety standards for side-impact and pedestrian protection, and to extend other standards to cover light trucks and vans. NHTSA's 5-year plan will be periodically revised, based on public comment and in response to continual changes in the motor vehicle safety field. Authorizations for FY 1980 will also permit continuation of the defect recall program. NHTSA now has pending before it three major fuel efficiency issues: whether to lower 1981 model year standards slightly for light trucks and vans, whether to revise passenger-car standards already in place through 1985, and what the standards should be for light trucks and vans in model years 1982 and beyond. Since the Uniform Tire Quality Grading Standards issued by NHTSA in 1975 have been reaffirmed, consumers will have comparative data on all bias tires made after 1 Apr 1979 and bias belted made after 1 Oct 1979. NHTSA expects to establish an effective date for radial tires as well. NHTSA is now working to make the consumer ratings provision (concerning crashworthiness and repairability) of the Cost Savings Act a reality, and has improved its consumer participation via its town meetings and Hotline. NHTSA remains firmly convinced that the statutory directives set forth in the Vehicle Safety Act and the Cost Savings Act contribute vitally to the safety, health, and well-being of the public, and deserve to be pursued with as much support in the future as they have been to date.

by Joan B. Claybrook  
National Hwy. Traffic Safety Administration, Washington,  
D.C. 20590  
1979; 17p  
Availability: Corporate author

HS-810 342

**STATEMENT BEFORE THE SUBCOMMITTEE ON  
ENERGY AND POWER, HOUSE INTERSTATE AND  
FOREIGN COMMERCE, CONCERNING  
AUTOMOTIVE FUEL ECONOMY STANDARDS  
UNDER TITLE V OF THE MOTOR VEHICLE  
INFORMATION AND COST SAVINGS ACT, MARCH  
13, 1979**

The requirements of the fuel economy standards for passenger cars through model year 1985, and for light trucks through model year 1981, correspond to a reduction of 220 billion gallons of gasoline from 1978 through 1990, or a savings of \$60 billion in imported fuel costs. At \$.80 per gallon, a net savings of \$700 over a vehicle's lifetime is projected for 1985 models



meeting the standards now in place. Changes in vehicle technology will be sufficient to allow manufacturers to meet the standards without significantly changing their traditional product mix, and the projected amount of capital needed to achieve these improvements is within the industry's capability. Ford Motor Co. and General Motors Corp. have asked the National Hwy. Traffic Safety Administration (NHTSA) to revise passenger car standards for model years 1981-1984 to make them more cost-effective. NHTSA is presently examining documentation from these two companies to see if there has been a significant change in the basis for the fuel economy standards from Jul 1977 when manufacturers indicated their capability to comply with the standards. NHTSA is also considering Chrysler Corp.'s petition for a reduction in standards for 1981 model light trucks. NHTSA has recommended minor changes in Title V concerning the treatment of low volume manufacturers, carry-forward and carry-back of credits for exceeding fuel economy standards, and the treatment of foreign manufacturers that begin production in the U.S. There has been excellent coordination among the Dept. of Transportation, the Dept. of Energy, and the Environmental Protection Agency (EPA) regarding automotive fuel economy proposals and rules. It is NHTSA policy to set fuel economy requirements at levels that do not require the use of diesel engines, until there is more information on the health-effects issue. Another item of concern is the growing discrepancy (from less than one to over three mpg) between fuel economy measured on the EPA test cycle and on-road fuel economy.

by Joan Claybrook  
National Hwy. Traffic Safety Administration, Washington,  
D.C. 20590  
1979; 4p 1ref  
Availability: Corporate author

HS-810 343

**STATEMENT BEFORE THE SUBCOMMITTEE ON  
SURFACE TRANSPORTATION, HOUSE  
COMMITTEE ON PUBLIC WORKS AND  
TRANSPORTATION, CONCERNING THE  
IMPLEMENTATION OF THE HIGHWAY SAFETY  
ACT OF 1978, MONDAY, MARCH 19, 1979**

A section-by-section account is presented of National Hwy. Traffic Safety Administration (NHTSA) efforts to implement the provisions of the Highway Safety Act of 1978, and budget requests for fiscal years 1979 and 1980 are attached. In cooperation with the states, a comprehensive study is being made of the need for and means to establish an automated National Driver Register. NHTSA is looking at those states whose penalties for 55 mph violations are noticeably weaker than for other types of speed violations so that an assessment can be made of their conformity with the law. Efforts to support the states in speed enforcement shall be continued via technical assistance and funding. NHTSA is working with the states to implement changes in highway safety programs resulting from amendment of section 402. The necessary guidelines, procedures, and criteria are being developed for making and administering grants for developing innovative approaches to highway safety problems. A complete study is being made of the effect of revocation of penalties for states not enacting motorcycle helmet use laws. Several studies have been made by NHTSA over the past two years on the effects of helmets and helmet use laws on highway safety. Based on their findings which show the effectiveness of helmets in reducing head injuries, and the higher use rates in states with

helmet laws, NHTSA is urging states to retain or reenact helmet laws, and encouraging manufacturers, insurance personnel, the medical community, safety organizations, and citizen action groups to support helmet use laws. A study is underway to evaluate efforts to detect and prevent the use of marijuana and other drugs by drivers. Efforts are being made to aid states in developing programs for encouraging safety belt and child restraint use, as well as expanding the public education program on safety belt use. A study is being conducted by the National Academy of Sciences on methods of encouraging safety belt use. States have been advised of the ban on using highway safety funds to retrofit state-owned vehicles with passive restraint systems. An amendment has been made to NHTSA's regulation on tire identification and recordkeeping, concerning exemptions for retread tire manufacturers.

by Joan Claybrook  
National Hwy. Traffic Safety Administration, Washington,  
D.C. 20590  
1979; 16p  
Availability: Corporate author

HS-810 344

**STATEMENT BEFORE THE SUBCOMMITTEE ON  
TRANSPORTATION, AVIATION AND WEATHER,  
HOUSE SCIENCE AND TECHNOLOGY  
COMMITTEE, MARCH 20, 1979**

The research and development programs of the National Hwy. Traffic Safety Administration (NHTSA) are discussed. Following the Experimental Safety Vehicle program begun in 1968, a second generation of experimental vehicles, begun in the mid-1970's, is being developed under the Research Safety Vehicle (RSV) program. Full working prototypes have been built by Minicars, Inc. and Calspan Corp. and will be tested in the U.S., Europe, and Japan to demonstrate that advanced safety features can be designed into production cars by the mid-1980's, in fuel-efficient, low-emission, practical, and economical automobiles. Minicars has also constructed and is testing a Large Research Safety Vehicle. In addition to the Integrated Vehicle Research program, research is being conducted in both passenger and heavy-duty vehicle safety, in automotive fuel economy, and in highway safety involving nonvehicle factors such as the driver. The National Center for Statistics and Analysis, the primary highway accident data collection and analysis institution in the U.S., is a cornerstone of NHTSA's research and development program. NHTSA also operates a vehicle engineering research and test center in Ohio with laboratories and other facilities for testing vehicles, vehicle equipment, and tires. To guide motor vehicle research activities, NHTSA has just completed a five-year plan that identifies research needs according to priorities in rulemaking. The identification is made by analysis of accident data, motor fuel conservation needs, technological potential, and industrial capability.

by Joan Claybrook  
National Hwy. Traffic Safety Administration, Washington,  
D.C. 20590  
1979; 15p  
Availability: Corporate author



October 31, 1979

HS-810 344

HS-900 018

## **FINANCIAL MANAGEMENT OF STATE HIGHWAY SAFETY PROGRAMS. COURSE GUIDE**

This course guide provides guidelines for planning, administering, and teaching a 3 1/2 day course in the financial management of state highway safety programs. The participant's educational background should include at least 60 credits (a B.A.

B.S. degree preferable) at the undergraduate level with a strong background in accounting, business, and management. The participant also should have an ability to learn in a participant-centered environment. Class size should be between 8 and 20 participants. All instructor material is directed at the instructor who has experience in financial management and knowledge of highway safety programs at the Federal, state, and local levels. Twenty-one hours of instruction are divided into 14 90-minute sessions. The content of each day's instruction has a single theme (planning, initiating, administering, and closing) which gives direction to the day's presentations and classroom activities. Multiple-choice tests are provided for use at the discretion of the instructor. Evaluation questionnaires are provided which may be used by the instructor, the participant, and a third party in order to assess the course. Slides have been prepared to accompany the course.

Kenard McPherson

McPherson and Associates, Darien, Conn.; National Public Services Res. Inst., Alexandria, Va.

78; 68p

Learninghouse training materials. Subject: State Highway Safety Program Financial Management. Educational level: College Undergraduate Courses, 60 Credits Minimum, B.A. or S. Preferable. Format: Course Guide. See also HS-900 019 and HS-900 020. Type of audience: Financial Managers. Availability: NHTSA General Services Div.

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HS-803 837

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 2: 1978 PONTIAC, 301 CID (4.9 LITERS), 2V. INTERIM REPORT, MAY 1978

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MOTOR CARRIER ACCIDENT INVESTIGATION. NL INDUSTRIES, INC. AND THURSTON MOTOR LINES, INC. ACCIDENT, APRIL 27, 1978, MORGANTON, NORTH CAROLINA

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PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 8: 1978 BUICK, 231 CID (3.8 LITER), 4V, TURBOCHARGED. INTERIM REPORT, SEPTEMBER 1978

HS-803 837

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 2: 1978 PONTIAC, 301 CID (4.9 LITERS), 2V. INTERIM REPORT, MAY 1978

HS-803 831

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 3: 1978 AMC, 121 CID (2.0 LITERS), 2V. INTERIM REPORT, MAY 1978

HS-803 832

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 4: 1978 PONTIAC, 151 CID (2.5 LITERS), 2V. INTERIM REPORT

HS-803 833

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 5: 1978 CHEVROLET, 200 CID (3.3 LITERS), 2V. INTERIM REPORT, JUNE 1978

HS-803 834

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 6: 1978 VOLKSWAGEN DIESEL, 90 CID (1.5 LITER), F. I. [FUEL INJECTION]. INTERIM REPORT, JULY 1978

HS-803 835

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 7: 1978 FORD, 98 CID (1.6 LITERS), IN. INTERIM REPORT, JULY 1978

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PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 9: 1978 FORD, 300 CID (4.9 LITER), IV. INTERIM REPORT, SEPTEMBER 1978

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SUOMEN TIELIIKENNEONNETTOMUODET VUONNA 1977, LISANA ERAITA TIETOJA VUODESTA 1958 ALKAEN (ROAD TRAFFIC ACCIDENTS IN FINLAND 1977, WITH SOME ADDITIONAL FIGURES STARTING FROM THE YEAR 1958)

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## FORD

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 7: 1978 FORD, 98 CID (1.6 LITERS), IN. INTERIM REPORT, JULY 1978

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HS-803 893

MOTORCYCLE SAFETY. A REVIEW OF INFORMATION GATHERED FROM OVERSEAS: JANUARY, 1978 [UNITED STATES AND UNITED KINGDOM]

HS-025 631

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HS-810 341

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HS-803 837

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HS-803 831

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HS-803 832

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HS-803 833

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 5: 1978 CHEVROLET, 200 CID (3.3 LITERS), 2V. INTERIM REPORT, JUNE 1978

HS-803 834

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HS-803 835

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 7: 1978 FORD, 98 CID (1.6 LITERS), IN. INTERIM REPORT, JULY 1978

HS-803 836

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HS-803 838

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AUTOMOBILE INSURANCE LOSSES, NON-COMMERCIAL COLLISION COVERAGES. VARIATIONS BY MAKE AND SERIES, VANS, PICKUPS, AND UTILITY VEHICLES. 1978 MODELS DURING THEIR FIRST YEAR, 1977 MODELS DURING THEIR FIRST TWO YEARS

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A MODEL FOR THE MONTE CARLO SIMULATION OF TRAFFIC FLOW ALONG TWO-LANE SINGLE-CARRIAGEWAY RURAL ROADS

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A PROGRAM FOR THE MONTE CARLO SIMULATION OF VEHICLE TRAFFIC ALONG TWO-LANE RURAL ROADS. AN APPLICATION OF STRUCTURED PROGRAMMING TECHNIQUE AND SIMULA-67 LANGUAGE

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**MORGANTON**

MOTOR CARRIER ACCIDENT INVESTIGATION. NL INDUSTRIES, INC. AND THURSTON MOTOR LINES, INC. ACCIDENT, APRIL 27, 1978, MORGANTON, NORTH CAROLINA

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**MOTION**

WEIGHING VEHICLES IN MOTION

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AN INVESTIGATION OF THE RETAIL USED MOTOR VEHICLE MARKET: AN EVALUATION OF DISCLOSURE AND REGULATION

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COST EVALUATION FOR FOUR FEDERAL MOTOR VEHICLE STANDARDS. VOL. 1. FINAL REPORT

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COST EVALUATION FOR FOUR FEDERAL MOTOR VEHICLE STANDARDS. TASK 6, ADDITIONAL BUMPERS, FMVSS 215, EXTERIOR PROTECTION. FINAL REPORT

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METHODOLOGY OF POWER COMPARISON OF MOTOR VEHICLES (UBERLEGUNGEN ZUR METHODIK DES ENERGETISCHEN VERGLEICHES VON STRASSEN FAHRZEUGEN)

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MOTOR VEHICLE STATISTICS. 1977 ACCIDENT AND OPERATIONAL STATISTICAL DATA. STATE OF NEW YORK DEPARTMENT OF MOTOR VEHICLES

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HS-025 649

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 8: 1978 BUICK, 231 CID (3.8 LITER), 4V, TURBOCHARGED. INTERIM REPORT, SEPTEMBER 1978

HS-803 837

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PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 2: 1978 PONTIAC, 301 CID (4.9 LITERS), 2V. INTERIM REPORT, MAY 1978

HS-803 831

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 4: 1978 AMC, 121 CID (2.0 LITERS), 2V. INTERIM REPORT, MAY 1978

HS-803 832

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 4: 1978 PONTIAC, 151 CID (2.5 LITERS), 2V. INTERIM REPORT

HS-803 833

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 5: 1978 CHEVROLET, 200 CID (3.3 LITERS), 2V. INTERIM REPORT, JUNE 1978

HS-803 834

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 6: 1978 VOLKSWAGEN DIESEL, 90 CID (1.5 LITER), F. I. [FUEL INJECTION]. INTERIM REPORT, JULY 1978

HS-803 835

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 7: 1978 FORD, 98 CID (1.6 LITERS), IN. INTERIM REPORT, JULY 1978

HS-803 836

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 9: 1978 FORD, 300 CID (4.9 LITER), IV. INTERIM REPORT, SEPTEMBER 1978

HS-803 838

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 10: 1978 HONDA, 98 CID (1.6 LITERS). INTERIM REPORT, DECEMBER 1978

HS-803 839

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EFFECTS OF HOURS OF SERVICE, REGULARITY OF SCHEDULES, AND CARGO LOADING ON TRUCK AND BUS DRIVER FATIGUE. FINAL REPORT

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A PROGRAM FOR THE MONTE CARLO SIMULATION OF VEHICLE TRAFFIC ALONG TWO-LANE RURAL ROADS. AN APPLICATION OF STRUCTURED PROGRAMMING TECHNIQUE AND SIMULA-67 LANGUAGE

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SUOMEN TIELIIKENNEONNETTOMUUDET VUONNA 1977, LISANA ERAITA TIETOJA VUODESTA 1958 ALKAEN (ROAD TRAFFIC ACCIDENTS IN FINLAND 1977, WITH SOME ADDITIONAL FIGURES STARTING FROM THE YEAR 1958)

HS-025 739

## STATEMENT

STATEMENT BEFORE THE SUBCOMMITTEE ON CONSUMER PROTECTION AND FINANCE, HOUSE INTERSTATE AND FOREIGN COMMERCE COMMITTEE, CONCERNING AUTHORIZATIONS FOR AND IMPLEMENTATION OF THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, AND THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT, FEBRUARY 26, 1979

HS-810 341

STATEMENT BEFORE THE SUBCOMMITTEE ON ENERGY AND POWER, HOUSE INTERSTATE AND FOREIGN COMMERCE, CONCERNING AUTOMOTIVE FUEL ECONOMY STANDARDS UNDER TITLE V OF THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT, MARCH 13, 1979

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STATEMENT BEFORE THE SUBCOMMITTEE ON SURFACE TRANSPORTATION, HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, CONCERNING THE IMPLEMENTATION OF THE HIGHWAY SAFETY ACT OF 1978, MONDAY, MARCH 19, 1979

HS-810 343

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HS-810 344

## STATES

HIGHWAY HAZARDS: WHAT SOME STATES ARE DOING FOR THEM

HS-025 798

MOTORCYCLE SAFETY. A REVIEW OF INFORMATION GATHERED FROM OVERSEAS: JANUARY, 1978 [UNITED STATES AND UNITED KINGDOM]

HS-025 631

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 8: 1978 BUICK, 231 CID (3.8 LITER), 4V, TURBOCHARGED. INTERIM REPORT, SEPTEMBER 1978

HS-803 837

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 2: 1978 PONTIAC, 301 CID (4.9 LITERS), 2V. INTERIM REPORT, MAY 1978

HS-803 831

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SE-

RIES, REPORT NO. 3: 1978 AMC, 121 CID (2.0 LITERS), 2V. INTERIM REPORT, MAY 1978

HS-803 832

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 4: 1978 PONTIAC, 151 CID (2.5 LITERS), 2V. INTERIM REPORT

HS-803 833

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 5: 1978 CHEVROLET, 200 CID (3.3 LITERS), 2V. INTERIM REPORT, JUNE 1978

HS-803 834

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 6: 1978 VOLKSWAGEN DIESEL, 90 CID (1.5 LITER), F. I. [FUEL INJECTION]. INTERIM REPORT, JULY 1978

HS-803 835

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 7: 1978 FORD, 98 CID (1.6 LITERS), IN. INTERIM REPORT, JULY 1978

HS-803 836

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 9: 1978 FORD, 300 CID (4.9 LITER), IV. INTERIM REPORT, SEPTEMBER 1978

HS-803 838

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 10: 1978 HONDA, 98 CID (1.6 LITERS). INTERIM REPORT, DECEMBER 1978

HS-803 839

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IMPACT TEST OF COMPACT VEHICLE WITH MODIFIED SIDE STRUCTURE, 35 MPH, 60 DEGREE IMPACT, IMPALA-TO-VOLARE, TEST NO. 10. FINAL REPORT

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## TIELIKENNEONNETTOMUDET

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## **TITLE**

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STATEMENT BEFORE THE SUBCOMMITTEE ON CONSUMER PROTECTION AND FINANCE, HOUSE INTERSTATE AND FOREIGN COMMERCE COMMITTEE, CONCERNING AUTHORIZATIONS FOR AND IMPLEMENTATION OF THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, AND THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT, FEBRUARY 26, 1979

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## TROUBLE

AUTOMOTIVE TROUBLE-SHOOTING QUIZ-MATCH WITS WITH THE TEEN-AGE DIAGNOSTIC CHAMPS

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EFFECTS OF HOURS OF SERVICE, REGULARITY OF SCHEDULES, AND CARGO LOADING ON TRUCK AND BUS DRIVER FATIGUE. FINAL REPORT

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REMARKS AT MAINTENANCE COMMITTEE MEETING [REGULAR COMMON CARRIER CONFERENCE], NEW ORLEANS, JANUARY 17, 1979 [TRUCK SAFETY]

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## TUNGSTEN

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HS-025 640

## TURBOCHARGED

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 8: 1978 BUICK, 231 CID (3.8 LITER), 4V, TURBOCHARGED. INTERIM REPORT, SEPTEMBER 1978

HS-803 837

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ESTIMATION OF LEFT-TURN SATURATION FLOWS

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TWILIGHT [DANGERS OF DRIVING]

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**American Motorcycle Assoc., Dept. of Government**

**Relations, P.O. Box 141, Westerville, Ohio 43081**

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02140**

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**Australian Road Res. Board, Box 156 (Bag 4),**

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**Battelle, Columbus Labs., 505 King Ave., Columbus,  
Ohio 43201**

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**Battelle, Columbus Labs., 505 King Ave., Columbus,  
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**BioTechnology, Inc., 3027 Rosemary Lane, Falls  
Church, Va. 22042**

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**Bureau of Motor Carrier Safety, Washington, D.C. 20590**

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**California Dept. of Motor Vehicles, Res. and Devel.  
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**California Inst. of Tech., Jet Propulsion Lab., 4800 Oak  
Grove Dr., Pasadena, Calif. 91103**

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**Center for Public Representation, 520 University Ave.,  
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**Department of Energy, Bartlesville Energy Technology  
Center, P.O. Box 1398, Bartlesville, Okla. 74003**

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**Dunlap and Associates, Darien, Conn.**

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**Dunlap and Associates, Inc., One Parkland Drive,  
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PRC Systems Sciences Co., 7600 Old Springhouse Rd.,  
McLean, Va. 22102  
HS-803 797
- DOT-HS-6-01348**  
Southwest Res. Inst., Tire Evaluation Section, P.O. Drawer  
28510, San Antonio, Tex. 78284  
HS-803 801
- DOT-HS-6-01429**  
Colorado Dept. of Highways, Div. of Hwy. Safety, 4201 E.  
Arkansas Ave., Denver, Colo. 80222  
HS-803 680
- DOT-HS-7-01530**  
University of Michigan, Hwy. Safety Res. Inst., Huron  
Pkwy. and Baxter Rd., Ann Arbor, Mich. 48109  
HS-803 879
- DOT-HS-7-01617**  
Man Factors, Inc., 4433 Convoy St., San Diego, Calif. 92111  
HS-803 809
- DOT-HS-7-01767**  
John Z. De Lorean Corp., Res. and Engineering Div., P.O.  
Box 427, Bloomfield Hills, Mich. 48013  
HS-803 871
- DOT-HS-7-01767-Mod-3**  
John Z. De Lorean Corp., Res. and Engineering Div., P.O.  
Box 427, Bloomfield Hills, Mich. 48013  
HS-803 873
- DOT-HS-7-01789**  
Corporate-Tech Planning Inc., 275 Wyman St., Waltham,  
Mass. 02154  
HS-803 963
- DOT-HS-7-01818**  
Systech Corp., Codd Professional Bldg., Severna Park, Md.  
21146  
HS-803 858
- DOT-HS-8-01819**  
Indiana Univ., Inst. for Res. in Public Safety, 400 Seventh  
St., Bloomington, Ind. 47405  
HS-803 793  
Indiana Univ., Inst. for Res. in Public Safety, 400 Seventh  
St., Bloomington, Ind. 47405  
HS-803 794
- DOT-OS-60156**  
Calspan Corp., 4455 Genesee St., Buffalo, N.Y. 14221  
HS-803 812

**DOT-RA-75-41**

California Inst. of Tech., Jet Propulsion Lab., 4800 Oak  
Grove Dr., Pasadena, Calif. 91103

HS-025 648

**DOT-TSC-1046**

Arthur D. Little, Inc., Acorn Park, Cambridge, Mass. 02140

HS-803 840

**DOT-TSC-1355**

Lexington Technology Associates, 10 Wingate Rd., Lexington,  
Mass. 02173

HS-803 543

**DOT-TSC-1487**

Aerodyne Res., Inc., Bedford Res. Park, Crosby Drive,  
Bedford, Mass. 01730

HS-803 722

**NSF-ENV77-15332**

Perceptronics, Inc., Decision Res., 1201 Oak St., Eugene,  
Oreg.

HS-025 289

**RA-77-07**

Department of Energy, Bartlesville Energy Technology  
Center, P.O. Box 1398, Bartlesville, Okla. 74003

HS-803 831

Department of Energy, Bartlesville Energy Technology  
Center, P.O. Box 1398, Bartlesville, Okla. 74003

HS-803 832

Department of Energy, Bartlesville Energy Technology  
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HS-803 833

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HS-803 834

Department of Energy, Bartlesville Energy Technology  
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HS-803 835

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Department of Energy, Bartlesville Energy Technology  
Center, P.O. Box 1398, Bartlesville, Okla. 74003

HS-803 839

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## **CONTRACTS AWARDED**

DOT-HS-7-01759 Mod. 2

### **EFFECTS OF RECENT VEHICLE DESIGN CHANGE ON SAFETY PERFORMANCE**

The recent characteristics of the passenger car occupant safety problem in the side impact modes shall be determined, and its future characteristics then projected, reflecting the "Estimated Future Safety Impact" of recent design changes combined with the effects of implementing Federal Motor Vehicle Safety Standard (FMVSS) 208 Passive Protection System amendment of 30 Jun 79. The information needed relates to upgrading FMVSS 214 side impact protection when struck by a moving barrier, the placement and performance of dummies, and possible interior occupant contact protection and compartment integrity criteria. Information shall be developed from available National Crash Severity Study (NCSS) and Fatal Accident Reporting System (FARS) data to relate conditions of impact direction (2, 3, 4, 8, 9, and 10 o'clock) and severity with individual and combined occupant positions (near side and far side) and shall relate these to the mechanisms of injury (contact area distribution and ejection) and injury severity. The effect of vehicle class and of belt usage (lap belt only, and combined lap and shoulder belt) shall be examined. The frequency of air bag deployments in side crashes shall be estimated (longitudinal deltaV of 12 mph or greater) and the mechanisms of injury of this subset viewed separately. In addition to NCSS and FARS data, comparisons with overall data shall be considered in estimating the restraint performance function.

Minicars, Inc., Kinetic Research Division, 55 Depot Road,  
Goleta, California 93017  
Increased \$34,766.00  
Extended to 30 Sep 79

DOT-HS-8-02037 Mod. 2

### **ANALYSIS OF RIDE QUALITY DATA BASE**

The final contract briefing shall be revised and presented at a public meeting on 19 Jul 79. Additional analyses of the questionnaire shall be performed to determine what types of vehicles were using rubber block suspensions, what truck profile characteristics are associated with different make/model trucks, and how the characteristics of the worst trucks compare with the characteristics associated with comfortable-riding trucks. ote

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."  
Increased \$9,500.00  
Extended to 5 Nov 79

DOT-HS-9-02219

### **EMERGENCY MEDICAL SERVICES HIGHWAY SIGN EVALUATION**

The "Star of Life" highway sign shall be adopted for use to identify significant points and methods of access to the emer-

gency medical services (EMS) system and concurrently to the emergency response system. To accomplish this, the needs for highway signs that could identify all methods and points of access to the emergency response system must be identified. From this set of needs, the subset of needs for access to EMS will be selected and combinations of signs using the Star of Life symbol designed. The needs for a sign shall be identified and documented with subsequent validation of the use of the Star of Life symbol to meet these needs.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."  
\$30,188.86  
To be completed six (6) months from date of contract award  
(28 Aug 79)

DOT-HS-9-02227

### **DOOR LOCKS AND DOOR RETENTION COMPONENTS**

Inspection, testing, and reporting of motor vehicle equipment for conformance with Federal Motor Vehicle Safety Standard No. 206, Door Locks and Door Retention Components, shall be performed in accordance with National Highway Traffic Safety Administration Laboratory Test Procedure TP-206-03 dated Nov 1978. 0e t

Artech Corporation, 2901 Telestar Court, Falls Church, VA  
22042  
Per Delivery Order

DOT-HS-9-02226

### **DUMMY, PART 572, MODIFIED IN ACCORDANCE WITH THE STATEMENT OF WORK AND SPECIFICATIONS CONTAINED HEREIN**

Seven (7) Part 572 dummies modified to assess the repeatability and reproducibility of their responses in various side impact environments shall be provided. The Part 572 dummies shall be modified by removal of their arms and certain parts of their shoulder mechanisms and suitably compensated by weights, to be utilized as the basis for vehicle evaluation in terms of an upgraded Federal Motor Vehicle Safety Standard 214 which includes dynamic testing of occupant protection systems in side impact. 0f n

Humanoid Systems, 747 East 223rd Street, Carson, California  
90745  
\$67,761.00  
To be completed twelve (12) weeks from date of contract award (22 Aug 79)

DOT-HS-9-02229

**PART 575.104 UTQG TEMPERATURE RESISTANCE GRADING**

A test program shall be conducted to determine compliance with the requirements of Part 575.104, Uniform Tire Quality Grading System, Paragraph (g), Temperature Resistance Grading, in accordance with National Highway Traffic Safety Administration Laboratory Test Procedures for Tire Temperature Resistance Testing TP-UTQG-H-01 dated 26 May 79. to

Standards Testing Laboratories, Inc., P.O. Box 592, Massillon, Ohio 44646

Per Delivery Order

To be completed four (4) months from initial availability of test tires

pacts; provide data tapes for additional tests; repair T-1 guards impacted in previous tests for use in additional tests; provide report for additional tests; and provide extensive coordination activities with Texas A and M University personnel who are engaged in the development of underride guards under contract to the Federal Highway Administration. Under Task 9 the following shall be accomplished: conduct Quinton Hazell (Q-H) 35 mph symmetric and 30 mph offset tests using Q-H guards, and straight-truck symmetric tests (35 mph and static) using 5ST guards (developed by Texas A and M); fabricate dynamic test device faces for straight-truck tests and provide data tapes for these tests; and provide report for Q-H 35 mph symmetric and straight-truck 5ST tests.

Dynamic Science, Inc., 1850 West Pinnacle Peak Road,  
Phoenix, Arizona 85027  
Increased \$99,176.00  
No change

DOT-HS-7-01654 Mod. 8

**ESTABLISHMENT OF ZONE CENTERS FOR NASS**

After passing the Zone Center quality control process, all accident cases sampled between 1 Jan 79 and 15 Apr 79 will be entered into the National Accident Sampling System Remote Data Entry System via data terminal or batch input. Cases generating error messages will be corrected appropriately and reentered. All programming errors or other problems with the system will be reported to the Information System Division, National Center for Statistics and Analysis, on a daily basis. In addition, recommendations that will improve the system and enhance its field operations are anticipated. Opac

Calspan Field Services, Inc., Post Office Box 400, Buffalo, New York 14225  
Increased \$8767.00  
No change

DOT-HS-8-01933 Mod. 5

**TEST DEVICE AND TEST PROCEDURE TO ASSESS SIDE STRUCTURES**

Task 2 of Phase 2 will involve an evaluation, using accident data from the National Crash Severity Study and other appropriate files, of the sensitivity of the benefits to variations in weight of the test barrier, results to be projected to the 1985 population of vehicles and optimum test weight for providing greatest potential for injury reduction in the 1985 traffic mix to be determined; also, approximations of frontal force-crush characteristics shall be determined by vehicle weight category, using Task 3 results and other sources, and, if possible, optimum force-crush characteristics (in terms of injury reduction in a 1985 mix of new vehicles) for a side impact barrier shall be determined. Task 3 will involve the conduct of front load cell barrier tests to determine the characteristics of 1978, 1979, and 1980 model year vehicles in terms of force-deflection characteristics. Using the selected vehicle from Task 3, Task 4 will involve car-to-car crash testing into selected vehicle models which have been modified, the results to be used to determine the ability of the side impactor test device to reproduce the car-to-car crash environment. Task 5 will involve a modification of the side impactor with the major objective of reducing the fabrication and materials cost. Full-scale testing shall be conducted in Task 6 as necessary to evaluate the performance and repeatability in probable compliance test conditions of the modified side impactor. Task 7 will involve crash testing to evaluate the repeatability of the finalized impactor and the compliance test condition. One side impactor for use in compliance testing and 15 sets of working drawings suitable for reproducing the side impactor shall be produced in Task 8.

Dynamic Science, Inc., 1850 West Pinnacle Peak Road,  
Phoenix, Arizona 85027  
Increased \$469,134.00  
To be completed by 3 Jun 80

DOT-HS-7-01749 Mod. 2

**IDENTIFICATION AND FEASIBILITY TEST OF SPECIALIZED RURAL PEDESTRIAN SAFETY TRAINING**

A rural pedestrian safety training program for grades kindergarten through 12th (Rural Youth Training Curriculum) shall be developed and tested for feasibility.

Applied Science Associates, Inc., Box 158, Valencia, Pennsylvania 16059  
Increased \$115,279.00  
Extended through 31 Jul 80

DOT-HS-8-01905 Mod. 6

**DEVELOPMENT OF COMPLIANCE TEST FOR TRUCK REAR UNDERRIDE PROTECTION**

Under Task 6 the following shall be accomplished: conduct two additional tests using the moving test device to complete development of this device; design and fabricate a Honeycomb-Faced moving test device (in addition to load-measuring test device) that will include a bumper system capable of simulating vehicle impact with the tires of a truck and will be designed for 35 mph symmetric and 30 mph offset im-

DOT-HS-9-02214 Mod. 1

**SENIOR EXECUTIVE SERVICE (SES) TRAINING**

An analysis shall be made of the evaluations from the Merit Pay Participants, focusing on specific important content areas



of the course. These content areas will be presented in the two half-day program to eliminate the less important steps and to highlight areas that have proven of most value to participants. Appropriate materials for this training shall be selected, drafted, and modified. A single "between sessions" assignment for the Senior Executive Service (SES) members to work on shall be developed. This assignment will be designed to aid the SES members in dealing with at least one of their merit pay subordinates. They will work with the merit pay subordinates particularly on the identification of critical elements and the drafting of performance standards, described in at least two levels of difficulty (fully acceptable and minimally acceptable). The training for 30 to 35 SES participants shall be conducted on 5 Sep 1979 (two half-day sessions) and 12 Sep 1979 (two half-day sessions), with one make-up class to be scheduled as necessary (two half-day sessions).to

ODS, Inc., 825 North Parkcenter Drive, Santa Ana, California 92705  
Increased \$6904.00  
No change

DOT-HS-9-02215

#### **BASIC ORDERING AGREEMENT FOR EVALUATION OF PASSIVE RESTRAINT SYSTEMS**

The protection performance of various restraint devices shall be evaluated via computer simulations, sled tests, and full-scale car crash tests. Computer simulations will study the effects of vehicle crashes on front-seat restrained occupants, to include the use of the three-dimensional crash victim simulation developed by Calspan for the National Highway Traffic Safety Administration, or the Highway Safety Research Institute three-dimensional model with the air bag option. The objectives will be to obtain preliminary indications of the restraint system performance, to determine the important system parameters, such as belt anchorage points and how they affect passenger loading and kinematics, and to obtain force-deflection characteristics for determining femur loads. The sled testing shall involve variable or programmable deceleration profiles, associated instrumentation, data recording/analysis equipment, and 16 mm high-speed motion picture cameras. Full-scale crash testing shall include barrier and pole crashes at various angles or configurations, side impacts (moving barrier) as specified in Federal Motor Vehicle Safety Standard 208, and car-to-car crashes with all sizes of passenger vehicles at various angles or configurations up to closing speeds of 80 mph (barrier equivalent velocity). Engineering assessments shall be made of the particular restraint systems.

Calspan Corporation, Post Office Box 400, Buffalo, New York 14225  
Per Task Order  
To be completed one (1) year from date of contract award (23 Aug 79)

DOT-HS-9-02216

#### **BASIC ORDERING AGREEMENT FOR EVALUATION OF PASSIVE RESTRAINT SYSTEMS**

The protection performance of various restraint devices shall be evaluated via computer simulations, sled tests, and full-scale car crash tests. Computer simulations will study the effects of vehicle crashes on front-seat restrained occupants, to include the use of the three-dimensional crash victim simulation developed by Calspan for the National Highway Traffic Safety Administration, or the Highway Safety Research Institute three-dimensional model with the air bag option. The objectives will be to obtain preliminary indications of the restraint system performance, to determine the important system parameters, such as belt anchorage points and how they affect passenger loading and kinematics, and to obtain force-deflection characteristics for determining femur loads. The sled testing shall involve variable or programmable deceleration profiles, associated instrumentation, data recording/analysis equipment, and 16 mm high-speed motion picture cameras. Full-scale crash testing shall include barrier and pole crashes at various angles or configurations, side impacts (moving barrier) as specified in Federal Motor Vehicle Safety Standard 208, and car-to-car crashes with all sizes of passenger vehicles at various angles or configurations up to closing speeds of 80 mph (barrier equivalent velocity). Engineering assessments shall be made of the particular restraint systems.

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Minicars, Inc., 35 La Patera Lane, Goleta, California 93017  
Per Task Order  
To be completed one (1) year from date of contract award (23 Aug 79)

DOT-HS-9-02217

#### **BASIC ORDERING AGREEMENT FOR EVALUATION OF PASSIVE RESTRAINT SYSTEMS**

The protection performance of various restraint devices shall be evaluated via computer simulations, sled tests, and full-scale car crash tests. Computer simulations will study the effects of vehicle crashes on front-seat restrained occupants, to include the use of the three-dimensional crash victim simulation developed by Calspan for the National Highway Traffic Safety Administration, or the Highway Safety Research Institute three-dimensional model with the air bag option. The objectives will be to obtain preliminary indications of the restraint system performance, to determine the important system parameters, such as belt anchorage points and how they affect passenger loading and kinematics, and to obtain force-deflection characteristics for determining femur loads. The sled testing shall involve variable or programmable deceleration profiles, associated instrumentation, data recording/analysis equipment, and 16 mm high-speed motion picture cameras. Full-scale crash testing shall include barrier and pole crashes at various angles or configurations, side impacts (moving barrier) as specified in Federal Motor Vehicle Safety Standard 208, and car-to-car crashes with all sizes of passenger vehicles at various angles or configurations up to closing speeds of 80 mph (barrier equivalent velocity). Engineering assessments shall be made of the particular restraint systems.

Dynamic Science, Inc., 1850 West Pinnacle Peak Road, Phoenix, Arizona 85027  
Per Task Order  
To be completed one (1) year from date of contract award (23 Aug 79)

U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY  
ADMINISTRATION  
Washington, D.C. 20590

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